The American School and University

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

1948-49

TWENTIETH ANNUAL EDITION

AMERICAN SCHOOL PUBLISHING CORPORATION
470 FOURTH AVENUE, NEW YORK 16, N. Y.

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DISTRIBUTORS
OF
EDUCATIONAL EQUIPMENT AND SUPPLIES

Listing in this directory is restricted to regional distributors of educational furniture, equipment, materials and supplies who maintain at a warehouse or store, stocks of the principal lines they represent.

Region 1—New England States

Apothecaries Hall Co.[3], 8-28 Benedict St., Waterbury, Conn.
J. T. Baker Co. reagent chemicals and acids

Edward E. Babb Company[1, 2], Div. of Milton Bradley Company, 17 Fordham Road, Boston 34, Mass.
Milton Bradley educational materials
DeVry audio-visual equipment
Peabody Seating Company
Ditto machines and supplies
Complete school supply and equipment line

Cambosco Scientific Co.[3], 37 Antwerp St., Boston, Mass.

Central Scientific Co.[3], 79 Amherst St., Cambridge A Sta., Boston, Mass.

Gledhill Bros., Inc.[1, 2], 20 Chestnut Ave., Boston, Mass.
American Crayon Company
Heywood-Wakefield school furniture
Jam Handy slide films, motion picture films
Kewaunee laboratory equipment
Audio-visual equipment and supplies

The Claflin Co.[3], 40 Mathewson St., Providence 3, R. I.

Doe & Ingalls, Inc.[3], Vine & Garden Sts., Boston, Mass.

Eastern Scientific Co., 51 Bassett St., Providence, R. I.

D. K. Hammett, Inc.[2], 620 Congress St., Portland, Maine
Audio-visual equipment
Film rentals and supplies

J. L. Hammett Co.[1, 2], Kendall Square, Cambridge 42, Mass.
American Seating Co.
Binney & Smith Co., Crayola & art materials
Harbutts Plasticine
Wayne Iron Works grandstands
Weber Costello Co., Hyloplate, Sterling and Light Sight chalkboards
Audio-visual equipment and apparatus
Blackboards
Bulletin boards
Composition and examination books
Hand looms for weaving & occupational therapy material

Howe & French, Inc.[3], 99 Broad St., Boston 10, Mass.

Jackson Chairs, Inc., 226 Park Sq. Bldg., Boston 16, Mass.
Clarin Mfg. Co. folding chairs
Howe Folding Furniture, Inc. folding tables
Norcor Mfg. Co. school seating
Vogel Peterson Co. checkroom equipment
Folding chairs, steel and wood

Jarrell-Ash Company[2, 3], 165 Newbury St., Boston 16, Mass.
Visual education equipment
Scientific instruments and accessories

Macalaster Bicknell Co.[3], 243 Broadway, Cambridge 39, Mass.
Branch: P.O. Box 5, Eastwood Branch, Syracuse, N. Y.

Macalaster Bicknell Co. of Conn., 181 Henry St., New Haven 11, Conn.

E. F. Mahady Co.[3], 851 Boylston St., Boston, Mass.

McAuliffe Paper Co., Inc., Burlington, Vt.
Agents for American Playground Device Co.
Agents for Arlington Seating Co.
Agents for Horn Brothers Company (folding bleachers)
Agents for Schieber "In-Wall" tables and benches
School supplies, art materials, sanitary equipment

The Papercrafters, Inc., 724 Main St., Holyoke, Mass.
School supplies

A. H. Rice Co., Inc.[2], 78 West Central St., Manchester, N. H.
Special representative for Bell and Howell
Everything in audio and visual aids

Visual Education Service, Inc.[2], 116 Newbury St., Boston 16, Mass.
Bell & Howell special representative
Bell & Howell authorized service station
Vesco motion picture film library
Educational films, slides, filmstrips

Visual Education Service, Inc., 53 Allyn St., Hartford, Conn.

Henry S. Wolkins Co.[1], 716 Columbus Ave., Boston, Mass.

Region 2—New York, New Jersey, Ontario, Canada

Ace Scientific & Industrial Co.[3], 810 Broadway, New York, N. Y.

American Seating Co.[1, 2], 935 W. Genesee St., Syracuse, N. Y.

Bacon & Vincent Co., Inc.[1], 1 Ellicott St., Buffalo 3, N. Y.
20 East 69th St., New York 21, N. Y.
Audio Visual Department
Bausch & Lomb opaque and transparency projectors
Beseler opaque and transparency projectors
Brush Sound Mirror tape recorders
Coronet instructional motion picture films
Jam Handy instructional slidefilms
Operadio sound slidefilm projectors, P. A. and inter-com. systems
Optron portable play-back turn table units
Popular Science Pub. Co., slidefilms, records, song books
R. C. A. projectors, victrolas, records, recorders, microphones, etc.
Radiant projection screens and shadow boxes
Rex-O-Cut disk recorders and turn tables
Spencer opaque and transparency projectors
S. V. E. slidefilm and slide projectors, slidefilms and slides
Furniture & Equipment Department
Bavinco home economics equipment
Burke playground and athletic equipment
Draper window shades
Gunlocke class room seating furniture
Hamilton science laboratory equipment
Peabody class room and auditorium seating
Schieber In-Wall folding tables and seating
Supplies Department
American Crayon art supplies and materials
Beckley-Cardy chalk and cork boards and supplies
Ditto duplicating machines, paper and supplies
Educational playthings for kindergarten & pre-school
School supplies and papers, general

[1] Member National School Service Institute.
[2] Member National Association of Visual Education Dealers.
[3] Laboratory Supply Distributor.

Eugene B. Baehr & Sons, 251-255 Fourth Ave., New York, N. Y.

Bardeen's, Inc.[1], 543 E. Genesee St., Syracuse 2, N. Y.
Art and handicraft products
Class registers and school forms
Playground and athletic equipment
School supplies and equipment

J. & H. Berge[3], 145 Hudson St., New York, N. Y.

Biological Supply Co.[3], 1176 Mt. Hope Ave., Rochester, N. Y.

Buchan Pictures, 79 Allen St., Buffalo, N. Y.

Buffalo Apparatus Corp.[3], 180 Main St., Buffalo, N. Y.

Central Scientific Co., 441 Clinton Ave., Newark 8, N. J.

Central Scientific Co., of Canada, Ltd., 146 Kendal Ave., Toronto 4, Ont., Canada

Eimer & Amend[3], 633 Greenwich St., New York 14, N. Y.

Earl A. Fisher, 71 Tompkins Ave., Mamaroneck, N. Y.

General Laboratory Supply Co.[3], 320 Market St., Paterson, N. J.

The Henry B. Gilpin Co.[3], 302 W. Lombard St., Baltimore, Md.

The Emil Greiner Co.[3], 161 Sixth Ave., New York, N. Y.

Otto R. Greiner Co.[3], 221 High St., Newark 2, N. J.

Hallenbeck & Riley[2], 562 Broadway, Albany 7, N. Y.
American Optical projectors and microscopes
Bausch & Lomb opaque projectors and microscopes
Victor motion picture equipment

J. L. Hammett Co.[1], 380 Jelliff Ave., Newark 8, N. J.
American Crayon crayons and art materials
Binney & Smith Crayola and art materials
Milton Bradley art and kindergarten materials
Harbutts Plasticine
Weber Costello Co., Hyloplate, Sterling and Light Sight chalkboards

The Geo. M. Hendry Co., Ltd.[1], 270-74 King St. West, Toronto, Ont., Canada

Bernard J. Hicks, Inc.[1], 1629 Burnett St., Brooklyn, N. Y.

Jack Hood School Supplies[1], 91 Erie Street, Stratford, Ontario, Canada

Institutional Cinema Service, Inc.[2], 1560 Broadway, New York 19, N. Y.
Rental of 16mm entertainment films
Visual aids service, specializing in educational films

King Cole's Sound Service, 340 Third Ave., New York, N. Y.

Long Island Institutional Equipment Co., Inc.[1, 2], 1501 Franklin Ave., Mineola, N. Y.

Marks & Fuller, Inc., 332 E. Main St., Rochester 4, N. Y.

Max Meyer, Inc.[3], 76 Willoughby St., Brooklyn, N. Y.

Moyer School Supplies Limited[1], 106–108 York St., Toronto, Ontario, Canada

New Jersey Laboratory Supply Co.[3], Div. of Central Scientific Co., 441 Clinton Avenue, Newark, N. J.

New York Laboratory Supply Co., Inc.[3], 525 Broadway, New York, N. Y.

New York Scientific Supply Co.[3], 20 West 30th St., New York, N. Y.

Palo Myers, Inc.[3], 81 Reade St., New York, N. Y.

Para Laboratory Supply Co.[3], 221 North Hermitage Ave., Trenton 8, N. J.

Peckham, Little & Co., 234 West 17th St., New York, N. Y.

Scientific Glass Apparatus Co.[3], P.O. Box 151, 49 Ackerman St., Bloomfield, N. J.

Sonocraft Company, Inc., 45 West 45th St., New York, N. Y.
Altec-Lansing loudspeakers and amplifiers
Ampro slide and motion picture projectors
Bausch & Lomb opaque projectors and microscopes
Brush Soundmirror tape recorders
DaLite screens
Panacoustic & Califone transcription players
Presto disc recorders, Speak-O-Phone
Radiant screens
Shure-Electro-Voice microphones
United World educational and entertainment films
Victor Motion Picture Equipment
Webster, Wiremaster & Air King wire recorders
Audio-visual equipment and supplies
Recording blanks and needles

Standard Scientific Supply Corp.[3], 34–38 West 4th St., New York, N. Y.

Sullivan Sound Service, 1043 Yonkers Ave., Yonkers, N. Y.
Ampro slide and motion picture projectors
DaLite screens
Radiant screens
United World educational and entertainment films
Audio-visual materials and equipment

Otto Ulbrich Company, Inc., 386 Main St., Buffalo, N. Y.

Webster Paper & Supply Co., Inc.[1], Central Warehouse Bldg., Albany 4, N. Y.
American Crayon Co. "Old Faithful" art items
Binney & Smith Co. "Gold Metal" art materials
Complete line of school and art materials
Playground items

Wilber Visual Service[2], New Berlin, N. Y.

Will Corporation[3], 39 Russell St., Rochester, N. Y.
Branch: 596 Broadway, New York 12, N. Y.

Art Zeiller Visual Education Service[2], 155 Washington St., Newark, N. J.

Region 3—Pennsylvania, Delaware, Maryland

Edward E. Babb & Co.[1], 3304 Arch St., West Philadelphia, Pa.

Burrell Technical Supply Co.[3], 1936–5th Ave., Pittsburgh, Pa.

E. J. Callahan & Co.[3], 14 West Barre St., Baltimore 1, Md.

Edward P. Dolbey & Co.[3], 3613 Woodland Ave., Philadelphia, Pa.

C. M. Eichenlaub Co.[1], 813 Architects Bldg., Philadelphia 3, Pa. 602 Empire Bldg., Pittsburgh 22, Pa.
Manitowoc chapel furniture
Peabody Seating Company
J. E. Sjostrom library and laboratory furniture
Wayne gymstands and grandstands
Steel lockers and filing cabinets

Fisher Scientific Co.[3], 711 Forbes St., Pittsburgh, Pa.

Garrett-Buchanan Co.[1], 12 South 6th St., Philadelphia, Pa.
Gametime playground equipment
RCA 16mm projectors
Radiant screens
Standard duplicators
School supplies and equipment

L. B. Herr & Son[1], 46–48 West King St., Lancaster, Pa.
General school supplies, art materials and seating

Wm. G. Hintz, Inc.[1], 838 Penn St., Reading, Pa.

William G. Johnston Company[1], 1130 Ridge Ave., Pittsburgh 12, Pa.
Arlington Seating Company
Berger steel furniture and lockers
Holmes sound projectors
J. E. Porter playground and gymnasium equipment
Walrus laboratory, household art equipment
Art and handicraft materials
General school supplies
Kindergarten supplies and furniture

Estate of Harry A. Keene[1], Pottstown, Pa.
Binney & Smith Co. Crayola and art materials
School supplies

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

Kemmerer Paper Company [1], 355 Hamilton St., Allentown, Pa.

Kunz Motion Picture Service [2], 1319 Vine St., Philadelphia, Pa. Branch Offices: 1905 Sanderson Ave., Scranton 9, Pa. 432 North Calvert St., Baltimore 2, Md.
Audio-visual equipment and supplies
16mm sound educational and entertainment library

Kurtz Bros. [1, 2], Clearfield, Pa. Branch: 8033 Bennett St., Pittsburgh 21, Pa.
Audio-visual equipment and supplies
School supplies and equipment

J. P. Lilley & Son [2], 277 Boas St., Harrisburg, Pa.
Castle, Official & Pictorial Films
Illustravox and Operadio sound slidefilm projectors
Operadio inter-communication and sound systems
Radiant projection screens
Sawyer Viewmasters and Viewmaster reels
Spencer (American Optical) slide and opaque projectors
SVE, Golde & Viewlex slide and filmstrip projectors
SVE slides and filmstrips
Distributor Victor sound projectors and cameras
Young America films, Popular Science filmstrips and recordings
Audio-visual equipment and film rental library
Sound projector service and maintenance

Lippincott Pictures, Inc., 4729 Ludlow St., Philadelphia, Pa.
Ampro projectors
Holmes projectors
Illustravox sound-slide films projector
Viewlex projectors
Young America films

Roberts & Meck, Inc. [1], 18th & Bellevue Sts., Harrisburg, Pa.
Bavinco home making equipment
Luther O. Draper window shades
Audio-visual equipment
Maintenance and sanitary supplies
School furniture
School supplies and equipment

Scientific Equipment Co. [3], 3527 Lancaster Ave., Philadelphia, Pa.

N. Snellenburg & Co., 12th & Market Sts., Philadelphia, Pa. Branch: 212 Oliver Ave. Bldg., Pittsburgh 22, Pa.

Stark Films [2], 537 North Howard St., Baltimore 1, Md.

Arthur H. Thomas Co. [3], West Washington Sq., Philadelphia, Pa.

Harry A. Trumpfheller, 1411 East Cliveden St., Philadelphia, Pa.
Arlington Seating Co. school seating
Folding chairs and tables
Wood tablet arm chairs and student chairs

L. C. Vath [2], Sharpsville, Pa.
Victor distributor and service headquarters
Audio-visual equipment and supplies
Educational and religious film library

Williams, Browne & Earle, Inc. [3], 918 Chestnut St., Philadelphia, Pa.

Region 4—Ohio, Michigan (Lower Peninsula), West Virginia

Olson Anderson Co. [2], 1113 McKinley Ave., Bay City, Mich.

Apex Theatre Service & Supply, Box 1389, Huntington, W. Va.

Capital Film Service [2], 224 Abbott Rd., East Lansing, Mich.
Bell & Howell special representative
Audio-visual equipment
Film rentals
Producers of industrial and educational slide films and motion pictures
Sound recording studios

Chemical Rubber Co. [3], West 112th St. at Locust Ave., Cleveland, Ohio

Church School Pictures, Inc. [2], 354 Arcade, 401 Euclid, Cleveland, Ohio
Specializing in educational and religious films, slides and filmstrips

Consolidated Supply Co., Woodland Ave., Columbus, Ohio

The Dobson-Evans Company [1], 110 W. 3rd Ave., Columbus, Ohio
American Crayon art supplies
American Seating furniture
DeVry audio-visual aids
Ditto machine, supplies and paper
Draper Shade Company
Everwear playground equipment
Kewaunee laboratory equipment
Leavitt bleachers and stadium
Art papers
School papers, note book fillers and tablets
School register class record plan books

Eberbach & Son Co. [3], 200 East Liberty St., Ann Arbor, Mich.
Laboratory equipment, apparatus and supplies

The Educational Supply Co., 26 S. State, Painesville, Ohio

Engleman Visual Education Service [2], 4754–56 Woodward Ave., Detroit 1, Mich.

Escar Motion Picture Service, Inc. [2], 7315 Carnegie Ave., Cleveland 3, Ohio
Bell & Howell special representative, sales and service
Popular Science teaching slidefilms, discs, equipment

Film Associates, 429 Ridgewood Drive, Dayton 9, Ohio

Fryan Film Service, 3228 Euclid, Cleveland 15, Ohio

Ralph V. Haile & Associates [2], 215 Walnut St., Cincinnati, Ohio

J. G. Haley [2], P. O. Box 703, Charleston 23, W. Va.

Harshaw Scientific [3], Div. of Harshaw Chemical Company, 1945 E. 97th St., Cleveland 6, Ohio
Branch: 9240 Hubbell Ave., Detroit 27, Mich.

W. F. Hausman Co., 2nd & Race Sts., Cincinnati 2, Ohio

J. R. Holcomb & Co. [1], 1710 E. 22nd St., Cleveland 14, Ohio

The James & Law Company [1], 217 W. Main St., Clarksburg, W. Va.

The Kauffman-Lattimer Company [3], 263 North Front St., Columbus, Ohio

Frank W. Kerr Co. [3], 422 W. Congress, Detroit 26, Mich.

Theodore Kundtz Co. [1], 1275 Main St., Cleveland 13, Ohio
Classroom furniture
Home economics laboratory furniture
Laboratory furniture

Kyle & Company [1, 2], Court St. & Washington Ave., Clarksburg, W. Va.

M. E. Lockard Co., 922 Roslyn Ave., Akron 2, Ohio
Holmes Projector Co.
Audio-visual equipment and supplies

M. H. Martin Co. [2], 50 Charles Ave., S.E., Massillon, Ohio
Bell & Howell special representatives
Operadio Manufacturing Co. sound systems
Radiant Screen Company
Audio-visual equipment and supplies

McFadden Corp. [1], 619 E. Hazel, Lansing, Mich.
Jasper wood furniture
Peabody Seating Co.
Wayne bus bodies
Steel lockers and files

The McManus-Troup Company, 713–715 Jefferson Ave., Toledo, Ohio

Michigan Products, Inc. [1], 1236 Turner St., Lansing, Mich.

Michigan School Service, Inc. [1], Main Box 509, Lansing, Mich.

Miller Office Supply Co. [1], 111 W. High St., Piqua, Ohio
Complete lines of school furniture and equipment

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

Murray Motion Picture Service Co., 879 Reibold Building, Dayton 2, Ohio

B. Preiser Co., Inc.[3], 416 W. Washington St., Charleston, W. Va.

Projection Aids Corporation, 1408 Schofield Building, Cleveland 15, Ohio

Reel Film Service, 308 Film Building, Cleveland, Ohio
Forway "Little Giant" Feather-Weight sound projectors
Jam Handy slide films and motion pictures
RCA audio-visual equipment and supplies
Radiant and Da-Lite screens
Siltronic portable sound systems
Free medical and safety films
16mm motion picture features
Sport, cartoon and musical films for rent or sale

Rupp & Bowman Co.[3], 315 Superior St., Toledo, Ohio

E. H. Sargent & Co. [3], Mich. Div., 1959 E. Jefferson, Detroit 7, Mich.

Sunray Films, Inc.[2], 2108 Payne Ave., Cleveland 14, Ohio
Astatic microphones
Bell Sound P.A. systems and recorders
Charles Beseler opaque equipment
Cathedral films
Coronet instructional films
Electro-Voice microphones
Hawley & Lord (sport films)
Loyola films
Sure Brothers microphones
Victor Animatograph Corp. sound projectors, Sonomaster and cameras
Vocational Guidance films
Wilcox-Gay tape recorder and disc Recordio
Young America films
Youth films
Complete line in audio-visual equipment and supplies
Distributors for: State of Ohio and Kentucky
Slide projectors, screens, films and supplies

Twyman Films, Inc.[2], 29 Central Ave., Dayton 1, Ohio

Harry M. Ward Company [1], 222 N. Walnut St., Bryan, Ohio

West Virginia Seating Co.[1], Huntington 9, W. Va.

The Max Wocher & Son Co.[3], 29 W. 6th St., Cincinnati, Ohio

Region 5—Virginia, N. & S. Carolina, Georgia, Florida, Tennessee, Mississippi, Alabama, District of Columbia, Puerto Rico

Alabama School Supply Co.[1, 2], 745 N. McDonough St., Montgomery 1, Ala.

American Seating Co. of Georgia [1, 2], 354 Nelson St., S.W., Atlanta 3, Ga.

Appalachian School Supply Co., Knoxville, Tenn.

Athens Equipment Co.[1], P. O. Box 332, Athens, Tenn.

Bishop Office Equipment, Inc.[1], 204 N. Orange Ave., Orlando, Fla.

Bowen Supply Co.[1], 125 E. Reynolds St., Plant City, Fla.

Milton Bradley Company, Box 1097, Atlanta 1, Ga.

Paul L. Brand [2], 2153 K St., N.W., Washington 7, D. C.

Calhoun Company [2], 101 Marietta St. N.W., Atlanta, Ga.
Branch: 1110½ Taylor St., Columbia 1, S. C.

Walker C. Cottrell, Jr., 408–10 Main St., Richmond, Va.

The Distributor's Group, Inc.[1, 2], 756 W. Peachtree St., N.W., Atlanta, Ga.

H. & W. B. Drew Co., Jacksonville 1, Fla.

Estes Surgical Supply Co.[3], 56 Auburn Ave., Atlanta, Ga.
Pyrex and Kimble glassware
Spencer microscopes
Analytical balances
Chemicals
General laboratory supplies

Flowers School Equipment Co.[1, 2], P. O. Box 1197, Richmond, Va.

Forbes Piano Company, Birmingham 3, Ala.

Gray & Creech, Inc. Winston-Salem 1, N. C.

James A. Head & Co., 2015 First Ave. N., Birmingham, Ala.
Bavinco homemaking equipment
Clarin steel folding chairs
Elliott addressing machines
Kewaunee laboratory furniture
Medart telescopic gym seats, basketball backstops, gym apparatus, basketball score boards, lockers and lockerobes
Peabody classroom and auditorium seating
R. C. Allen adding machines and calculators
Duplicating machines
Library furniture, blackboards and corkboards

Highland Products Co.[1], 720 Gay St., Knoxville 8, Tenn.

Ideal Pictures [2], 219 E. Main St., Richmond 19, Va.

Jones School Supply Co., Columbia, S. C.

Andres Justica, San Juan, Puerto Rico

Kay Surgical, Inc.[3], 1144 Madison Ave., Memphis 1, Tenn.

L. D. Lawrence Co., Inc.[1], 824 Abella Rd., Columbia, S. C.

Martin School Supply Co., San Juan, Puerto Rico
Beckley Cardy Co.
Ex-Cell Products Corporation
F. A. Owen Publishing Co.

The McGregor Company [1], 321 E. Clayton St., Athens, Ga.
DuPont Tontine window shades
Kewaunee laboratory equipment
Peabody Seating Company
Victor motion picture equipment
Weber Costello Co. LightSight chalkboards
Playground and athletic equipment

McKesson & Robbins, Inc.[3], Laboratory Supply Department, 1706 First Ave., Birmingham 3, Ala.

Mississippi School Supply Co.[1, 2], 116 East South St., Jackson, Miss.

John R. Moffit Co., Inc.[2], 19½ So. Perry St., Montgomery, Ala.
Ampro projectors and service
Brush Sound Mirror tape recorders
Horn folding bleachers
Irwin classroom and auditorium furniture
Jam Handy instructional filmstrips
New York Silicate glass blackboards

Nashville Products Co.[1], 158 Second Ave. N., Nashville, Tenn.

Wilfred Naylor [2], 1907 Fifth Ave. N., Birmingham 1, Ala.

Newton School Equipment Co.[1], P. O. Box 4334, Jacksonville, Fla.

Norman Laboratories & Studio, Arlington Suburb, Jacksonville, Fla.

Nu-Idea School Supply Co.[1], 127 Harvin St., Sumter, S. C.

John H. Pence [1], P. O. Box 863, Roanoke 5, Va.

Phipps & Bird, Inc.[3], 915 E. Cary St., Richmond, Va.

Porto Rico School Supply Co., Rio Piedras, Porto Rico

The Powers Co., 106–108 St. Michael St., Mobile 1, Ala.

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

Frank L. Rouser Co., Inc.[2], 317 W. Church Ave., Knoxville 11, Tenn.
Beseler opaque and transparency projectors
Popular Science Pub. Co. filmstrips, slides and records
Victor Animatograph Corporation distributors
Vocational Guidance Films, Inc.

School & Office Supply Co., 407 W. Clinch Ave., Knoxville, Tenn.

Sheridan School Supply Co., Greenwood, S. C.

Herschel Smith Co.[2], 119 Roach St., Jackson 110, Miss.

Southeastern Equipment Co., Inc.[1], Siler City, N. C.

Southern School Supply Co.[3], Raleigh, N. C.

Southern Scientific Co.[3], 188–192 Walton St. N.W., Atlanta, Ga.

Southern Visual Films[2], 687 Shrine Bldg., Memphis, Tenn.

Stevens—Pictures[2], 9536 N. E. Second Ave., Miami, Fla.

Strickland Film Co.[2], 141 Walton St. N.W., Atlanta 3, Ga.

Surgical Supply Co.[3], 40 W. Duval St., Jacksonville, Fla.

Tayloe Paper Co.[1, 2], 420 S. Front St., Memphis, Tenn.

Technical Products Co.[3], 158 Madison Ave., Memphis, Tenn.

Tennessee Equipment & Supply Co.[1], 1819 Church St., Nashville, Tenn.

Tennessee Office Supply Co., 203 West Clinch Ave., Knoxville, Tenn.

Universal School Equipment Co.[1], 3709 Hillsboro St., Raleigh, N. C.

Virginia School Equipment Co., Inc.[1], 111 E. Main St., Richmond 19, Va.

Region 6—Indiana, Illinois, Kentucky

Everett M. Bailey[1], 306 Indiana Ave., Pontiac, Ill.

Thos. Baird & Son[1], 245 N. Dearborn Ave., Kankakee, Ill.

A. M. Blood Co.[1], School Equipment Div., 326—20th St., Rock Island, Ill.

I. A. Bock School Service[1], 628 Park Ave., Sycamore, Ill.

Milton Bradley Co.[1], 811 S. Wabash Ave., Chicago 5, Ill.

Brady & Earnhart[1], 215 W. 3rd St., Marion, Ind.

Burke's Motion Picture Co.[2], 434 Lincoln Way West, South Bend 5, Ind.

Carpenter School Equipment Company[1], Mitchell, Ind.

Central School Supply Co., Inc.[1], 311 W. Main St., Louisville, Ky.

Central Scientific Co.[3], 1700 Irving Pk. Blvd., Chicago, Ill.

Chicago Apparatus Co.[3], 1735 N. Ashland Ave., Chicago, Ill.

A. Daigger & Co.[3], 159 W. Kinzie St., Chicago 10, Ill.

D. T. Davis Co.[2], 178 Walnut St., Lexington 34, Ky.

A. Flanagan Co., 320 W. Ohio St., Chicago 10, Ill.

Fletcher Visual Education Service[2], 218 W. Main St., Urbana, Ill.

Garden City Educational Co.[1], 27 S. Wabash Ave., Chicago 4, Ill.

General Biological Supply House[3], 761 E. 69th Pl., Chicago, 37, Ill.

The D. H. Goble Printing Co.[1], 15 S. East St., Greenfield, Ind.

Hoosier Supplies[1], Vincennes, Ind.

Ideal Pictures Corp.[2], 28 E. 8th St., Chicago, Ill.

Illinois School Supply Co., 114 S. 7th St., Quincy, Ill.

Kentucky School Equipment Co.[1], 117 S. 4th Ave., Louisville, Ky.

Kiger & Co., Inc.[1], 52–58 W. New York St., Indianapolis 4, Ind.
American Art Clay Co. clays, chalks
American Seating Co. furniture
Draper shades
Fellowcrafters craft supplies
Hamilton laboratory furniture
S. C. Johnson & Co. waxes
Mitchell Mfg. Co. folding tables
Montgomery program clocks
Shaw-Walker files and supplies
Victor motion picture machines

Arthur S. La Pine & Co.[3], 121 W. Hubbard St., Chicago, Ill.

Lee School Supply Co.[1], 21 South 4th St., Terre Haute, Ind.

Leonard Supply Company, Silver Lake, Ind.

Mapes Bros.[1], Ogden, Ill.

McHenry Educational Films[2], 537 S. Dearborn St., Chicago 5, Ill.

Midwest Visual Equipment Co.[2], 6961 North Clark, Chicago, Ill.

The Miller School & Office Supply Co.[1], 5031 Hohman Ave., Hammond, Ind.

Modern School Supply[1], 3810 E. 16th St., Indianapolis, Ind.
Cram maps and globes
Ditto duplicators and supplies
Jam Handy slide films and motion picture films
Peabody seating
RCA projectors
Wayne school bus bodies
Complete school supplies and equipment
Playground equipment
Sanitary and maintenance supplies

Potomac Engineering Corp.[1], 664 N. Michigan Ave., Chicago 11, Ill.

Rascher & Betzold, Inc.[3], 730 N. Franklin St., Chicago, Ill.

W. B. Rogers Co., 216 W. State St., Jacksonville, Ill.

C. H. Rousch & Co., Madison, Ind.

E. H. Sargent & Co.[3], 155 E. Superior St., Chicago, Ill.

Schaar & Co.[3], 754 W. Lexington St., Chicago 7, Ill.

Sunny Schick's, 407 W. Washington Blvd., Ft. Wayne, Ind.
Ampro slide and motion picture projectors
Bell and Howell 16mm projectors
Victor audio-visual supplies
S.V.E. slide and film strip projectors
T.D.C. equipment
Filmslide equipment, picture recording, etc.
Motion picture equipment and supplies

Scientific Supply Co.[3], 1867 Ogden Ave., Chicago 12, Ill.

Shick Supply & Equipment Co.[1], 726 McReynolds Ave., Danville, Ill.

Standard Science Supply Co.[3], 1232–34 N. Paulina St., Chicago, Ill.

O. J. Steffy & Son, Carlisle, Ind.

Stinson Projector Sales[2], 521 S. Lombard Ave., Oak Park, Ill.

Tri-State School Supply Co., Evansville 8, Ind.

W. M. Welch Mfg. Co.[3], 1515 Sedgwick St., Chicago 10, Ill.

Wilkens-Anderson Co.[3], 111 N. Canal St., Chicago 6, Ill.

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

Region 7—N. & S. Dakota, Iowa, Minnesota, Wisconsin, Upper Michigan, Manitoba, Canada

Brosk's[1], 5804 Seventh Ave., Kenosha, Wis.

Burgher-Williams & Range Typewriter Co., Virginia, Minn.

Christie School Supply, Ltd.[1], P. O. Box 300, Brandon, Manitoba, Canada

Colborn School Supply Co.[1], Grand Forks, N. D.

Coleman School Supply Company[1], Coleman, Wis.

Eau Claire Book & Stationery Co.[1, 2], Eau Claire, Wis.
American Crayon Co.
American Seating Co.
Berger steel lockers
Ditto, Inc. duplicators and supplies
Luther O. Draper window shades
Jam Handy slidefilms and motion picture films
Leavitt knockdown and telescoping bleachers
R.C.A. sound-on-film projectors
Tell City school chairs
Complete school supplies and equipment

J. W. Edgerly & Company, Ottumwa, Iowa

Educator Supply Co.[1], 309 N. Lawlor St., Mitchell, S. D.
School supplies and equipment

Farnham Stationery & School Supply Co.[1], 301 S. 5th St., Minneapolis, Minn.

Fond du Lac School Supply Co.[1], 36 S. Main St., Fond du Lac, Wis.
J. E. Burke playground equipment
Du Pont Tontine window shades
A. J. Nystrom maps
Peabody Seating Co.
Royale school papers
Wolber duplicators
School supplies and equipment

Gallagher Films[2], 113 S. Washington St., Green Bay, Wis.
Branch: 639 N. 7th St., Milwaukee 3, Wis.
Audio-visual equipment and supplies

Gateway Paper & Supply Co.[1], 156-160 St. Lawrence Ave., Beloit, Wis.

Holley School Supply Co.[1], 100 E. Grand Ave., Des Moines 7, Iowa

Hub City School Supply Co.[1], 2nd Ave., Aberdeen, S. D.

J. S. Latta & Son[1], 909 W. 23rd St., Cedar Falls, Iowa

Metropolitan Supply Co.[1], 602-616 Third St. S.E., Cedar Rapids, Iowa

Midwest Audio-Visual Co.[2], 1504 Hennepin Ave., Minneapolis, Minn.

Midwest-Beach Company[1], 222 S. Phillips Ave., Sioux Falls, S. D.
Hamilton laboratory furniture
RCA audio-visual supplies
Weber-Costello Co.
Complete school seating
Maintenance and sanitary supplies
Slides and film strips

National Camera Exchange[2], 86 S. 6th St., Minneapolis, Minn.

Northern School Supply Co.[1, 2], N.P. & 8th St., Fargo, N. D.

Northwest Products Co., 127 W. 10th St., Sioux Falls, S. D.

Photoart House[2], 844 N. Plankinton Ave., Milwaukee, Wis.

Roemer Drug Company[3], 806 N. Broadway, Milwaukee, Wis.

Ryan Visual Aids Service[2], 409 Harrison St., Davenport, Ia.

St. Paul Book & Stationery Co.[1, 2], 55 E. Sixth St., St. Paul 1, Minn.

Sioux Falls Book & Stationery Co.[1], 117-19 N. Phillips Ave., Sioux Falls, S. D.

Twin City School Supply Co., Neenah, Wis.

United Chemical Co.[1], 2115-19 Como Ave. S.E., Minneapolis, Minn.

Upper Peninsula Office Supply Co.[1], Marquette, Mich.

Geo. T. Walker & Co.[3], 324—5th Ave. S., Minneapolis, Minn.

Region 8—Missouri, Kansas, Nebraska

A. S. Aloe Company[3], 1819 Olive St., St. Louis, Mo.

Blackwell-Wielandy Co.[1], 1601 Locust St., St. Louis, Mo.

Bowlus School Supply Co.[1], 1015 N. Broadway, Pittsburg, Kan.

Buxton & Skinner Printing & Stationery Co.[1], 304 N. 4th St., St. Louis 2, Mo.

The Edwards Press[1], Osceola, Mo.

Erker Bros. Optical Co.[2], 610 Olive St., St. Louis 1, Mo.
Ampro slide and motion picture projectors
Bausch & Lomb slide and opaque projectors
Bell & Howell projectors and accessories
Castle and Official films
Da-lite and Radiant screens
Illustravox sound filmstrip projectors
Lantern slides made to order
S.V.E. projectors, slides and accessories
Complete line of audio-visual equipment and accessories

Fisher Scientific[3], St. Louis, Mo.

Goldsmith Book & Stationery Co., Wichita 1, Kan.

A. J. Griner Co.[3], 1827 McGee St., Kansas City 8, Mo.

B. R. Harris & Co.[1], 722 Washington St., Chillicothe, Mo.
Cram maps, globes
Howell playground equipment
Lyon Metal chairs, lockers, files
Natco sound projectors
Rice window shades

Heil Corporation[3], 210 S. 4 St., St. Louis, Mo.

Hicks-Ashby Company[1], 210 W. 8 St., Kansas City 6, Mo.

Hoover Brothers, Inc.[1, 2], 922 Oak St., Kansas City 6, Mo.

D. E. Hotchkin, Maryville, Mo.

Kansas City Laboratory Supply Co.[3], 1432 Wyandotte St., Kansas City 6, Mo.

Kansas City Sound Service Co.[2], 1402 Locust St., Kansas City 6, Mo.

Millard-Heath Company[3], 325 Olive St., St. Louis, Mo.

The Missouri Store Co., 909 Lowry St., Columbia, Mo.

Omaha School Supply Co.[1], 1113 Nicholas St., Omaha, Neb

Quivira Specialties Co.[3], 4010 W. 21 St., Topeka, Kan.
Clay-Adams scientific supplies
Federal Model 40 microscopes
Biological supplies and natural history books
Live and preserved specimens, slides

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

School and Park Supply Company, Inc.[1,2], 1650 S. Broadway, Wichita 11, Kan.
Ampro projection equipment and service
Bausch and Lomb projectors, opaque and transparency
Copyrite spirit duplicators
George F. Cram Company maps and globes
Radiant and DaLite projection screens
Chas. W. Rice and Company window shades
Wireway wire recorders
Art supplies
General school supplies and paper
Janitor supplies
Playground equipment and supplies
School and church furniture
Venetian blinds

School Purchasing & Supply Co.[1], Sterling, Kan.

School Specialty Supply[1], Salina, Kan.

Southwest Scientific Corp.[3], 122 South St. & Francis, Wichita, Kan.

Stephenson School Supply Co.[1], 935 O St., Lincoln, Neb.

Swank Motion Pictures[2], 620 Skinker Blvd., St. Louis, Mo.

Thacher, Inc.[1], 424–28 Quincy St., Topeka, Kan.

Thacher-Bangs, Inc.[2], 315 N. Emporia, Wichita, Kan.

The University Publishing Co.[1,2], Superior School Supply Co. 1126 Q St., Lincoln, Neb.
Branch: 1322 W. 13th St., Kansas City, Mo.
American Crayon art supplies
Bavinco homemaking equipment
DeVry sound projectors
Ditto duplicating machines and supplies
Irwin classroom and auditorium seating
Jam Handy slide films
Nystrom maps, globes and charts
Porter gym equipment
Smith heaters and toilets
Wayne gym stands and bleachers

Region 9—Washington, Oregon, Idaho, Montana

James C. Bangs, 137 N. Main St., Pocatello, Idaho

The Caxton Printers, Ltd.[1], 312 Main St., Caldwell, Idaho

C. M. Fassett Co.[3], W. 9 Trent Ave., Spokane 8, Wash.
Laboratory apparatus and chemicals

J. K. Gill & Co.[1], 408 Fifth Ave. S.W., Portland 4, Ore.

John W. Graham Co.[1], 708 Sprague Ave., Spokane, Wash.

Lowman & Hanford Co., 1515 - 2nd Ave., Seattle, Wash.

Moore's Motion Picture Service[2], 306–10 S. W. 9th Ave., Portland 5, Ore.

Northern School Supply Co.[1,2], 1505 Lovejoy St. N. W. Portland 9, Ore.
American Crayon Co.
American Seating Co., school furniture
Armstrong Cork bulletin boards
Ditto duplicators and supplies
Draper shades
Medart gymnasium seating and equipment
Sheldon & Co., laboratory and homemaking equipment
Stagecraft draperies, hardware and lighting
Victor cameras and projectors
Weber Costello Co. Hyloplate, Sterling, Lite-Site

Northern School Supply Co.[1,2], 1st Ave. N. & Great Northern Tracks, Great Falls, Mont.

Rarig Motion Picture Company[2], 5514 University Way, Seattle 5, Wash.
Audio-visual equipment and supplies

Rosser & Sutton[1], 211 W. Yakima Ave., Yakima, Wash.

Scientific Supplies Co.[3], 123 Jackson St., Seattle, Wash.

Shaw Surgical Co.[3], 620 S.W. 11th Ave., Portland, Ore.

Washington School Supply Co.[1], 814 - 6th Ave. S., Seattle 4, Wash.

Region 10—California, Arizona, Nevada, New Mexico, Honolulu, Hawaii

Allen School Supply Company, 58 S. MacDonald St., Mesa, Ariz.

A. S. Aloe Co.[3], 932 So. Hill St., Los Angeles Calif.

American Seating Co.[1,2], 6900 Avalon Blvd., Los Angeles, Calif.
Branch: 207 Van Ness Ave. S., San Francisco, Calif.

Armanko Office Supply Co., 152 N. Virginia St., Reno, Nev.

Austin Safe & Desk Co., Ltd., 1320 - 5th Ave., San Diego, Calif.

Benson, Smith & Co.[3], P. O. Box 2660, Honolulu, Hawaii

The Braun Corp.[3], P. O. Box 2262, Tmnl. Ann., Los Angeles, Calif.

Braun-Knecht-Heimann Co.[3], 1400 16 St., San Francisco, Calif.

The Calkins Division of Los Angeles Chemical Company[3], 934 S. Main St., Los Angeles 15, Calif.

Donald J. Clausonthue[2], 1829 N. Craig Ave., Altadena, Calif.

H. S. Crocker Co., Inc., Box 353, San Francisco, Calif.

Adolph Frese Corp.[3], 116 W. 17th St., Los Angeles, Calif.

Hirsch & Kaye[2], 239 Grant Ave., San Francisco 8, Calif.

O. B. Marston Supply Co.[1], 324 N. Central Ave., P. O. Drawer 1390, Phoenix, Ariz.

Morris Brothers, Stockton 6, Calif.

Motion Picture Enterprises[2], 121 S. Beretania, Honolulu, Hawaii

New Mexico School Supply Co.[1,2], 205 W. Copper Ave., Albuquerque, N. Mex.

PBSW Supply & Equipment Co.[1,2], Box 551, Phoenix, Ariz.

Pacific Laboratory Apparatus & Chemical Co.[3], 3555 Whittier Blvd., Los Angeles 23, Calif.

Pacific Western Equipment Corp.[1], 525 Santa Cruz Ave., Menlo Park, Calif.
Bavinco homemaking equipment
Hamilton laboratory equipment
Peabody Seating Co.

Photo & Sound Co.[2], 116 Natoma St., San Francisco, Calif
Bell & Howell special representative

Redman Scientific Co.[3], 585 Howard St., San Francisco, Calif.

Carroll W. Rice Co.[2], 424 - 40 St., Oakland 9, Calif.
Audio-visual complete line materials, equipment and service

Schwabacher Frey Co., 735 Market St., San Francisco, Calif.
Branch: Los Angeles 55, Calif.

Science Supplies[3], James Campbell Bldg., Honolulu, Hawaii

Screen Addettes, Inc.[2], 8479 Melrose Ave., Los Angeles, Calif.

Stationers Corp., 525 S. Spring St., Los Angeles, Calif.

University Apparatus Co.[3], 2229 McGee Ave., Berkeley, Calif.

Valley Office & School Equipment Co.[1], 1426 P St., Bakersfield, Calif.

John Wentworth Co.[1], 402 E. Central, Albuquerque, N. Mex.

Western Surgical Supply Co.[3], 661 S. Burlington Ave., Los Angeles 5, Calif.

Zellerbach Paper Co., 534 Battery St., San Francisco, Calif.
Branch: Box 3639, Los Angeles 54, Calif.

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

Region 11—Texas, Arkansas, Louisiana, Oklahoma

All State Supply Co.[1,2], 412 E. Jackson Ave., Jonesboro, Ark.

American Seating Co. [1,2], 2930 Canton St., Dallas, Texas

Arkansas Visual Education Service, Conway, Ark.

Association Films [2], 3012 Maple Ave., Dallas 4, Texas

Audio Video, Inc.[2], 4000 Ross Ave., Dallas 4, Texas
Branch: 1702 Austin St., Houston, Texas
RCA 16mm dealer
Audio-visual equipment and supplies

Bickley Brothers [1], 2017 Preston, Houston 2, Texas

Boren-Malone Co.[1], 211 S. Wewoka Ave., Wewoka, Okla.
Athletic goods and sportswear
School supplies and equipment

W. H. Curtin & Company [3], P. O. Box 118, Houston 1, Texas
Branch: 2800 Frenchmen St., New Orleans, La.
Laboratory apparatus and chemicals

Democrat Printing & Lithographing Co.[1,2], 114 E. 2nd St., Little Rock, Ark.
American Desk Manufacturing Company
Ampro visual equipment
Beckley-Cardy Slatebestos and Slatoplate chalkboards
Milton Bradley educational materials
Cram maps and globes
Complete school supply line

Denver Fire Clay Products Co.[3], Mills Bldg., El Paso, Texas

Dowling, Inc.[1], 2nd & Broadway, Oklahoma City, Okla.

Downs-Randolph Company [1], 20 E. 7th St., Tulsa 3, Okla.
School supplies and equipment

Clarence J. DuBos & Sons [1], 1774 N. Gayoso St., New Orleans 19, La.

Jasper Ewing & Sons [2], 725 Poydras St., New Orleans, La.

Greene Bros., Inc.[3], 1812 Griffin St., Dallas, Texas

Griggs Equipment Co.[1], Box 630, Belton, Texas
Auditorium seating
Kindergarten chairs
Movable chair desks
Tablet arm chairs
Window shades

Gulf States Equipment Co.[1,2], 1305 S. Akard St., Dallas, Texas

F. F. Hansell Bros., Ltd.[1], 131 Carondelet St., New Orleans 12, La.

Ideal Southern Pictures Co., 826 Barrone St., New Orleans, La.

I. L. Lyons & Co.[3], Laboratory Supply Department, 800 Techonpitoulas St., New Orleans, La.

Mine & Smelter Supply Co.[3], 410 San Francisco St., El Paso, Texas

Murray-Baker-Frederic, Inc.[3], New Orleans, La.

National-Ideal Pictures, 2024 Main St., Dallas, Texas

Oklahoma School & Office Supply Co.[1], 220 N. 3rd St., Muskogee, Okla.

Oklahoma Seating Co.[1], 19½ W. Main St., Oklahoma City, Okla.

H. C. Parker, Inc., 336 Camp St., New Orleans 12, La.

Parkin Printing & Stationery Co.[1], Little Rock, Ark.

Practical Drawing Co.[1], 2205 S. Lamar St., Dallas, Texas
Educational equipment and supplies

Refinery Supply Co.[3], 621 E. 4th St., Tulsa, Okla.

Rowley Co., Inc.[1], 619 Baronne St., New Orleans 12, La.

W. G. Smith Co.[1], 100 W. 12th St., Houston 8, Texas

Southern Seating Co., 614 Gravier St., New Orleans, La.

Southwestern Seating Co.[1], 307 Martinez St., San Antonio, Texas

Standard Office Supply Co.[1], 125 St. John St., Monroe, La.

Stanley Projection Co., 211½ Murray St., Alexandria, La.

Stirling Motion Picture Co.[2], 3152 Florida St., Baton Rouge, La.

Thompson Book & Supply Co.[1], 926 E. Main St., Ada, Okla.

Visual Education Incorporated [2], Lamar & 12th, Austin, Texas
Bell & Howell special representative
Jam Handy slidefilms and motion picture films
Young America slidefilms and motion picture films

Region 12—Colorado, Utah, Wyoming

American School Supply Co.[1], 1514 Arapahoe, Denver, Colo.

Bailey School Supply, Casper, Wyo.

Centennial School Supply Co.[1,2], Box 5224 Terminal Annex, Denver 17, Colo.

Denver Fire Clay Co.[3], 2301 Blake St., Denver 17, Colo.

Mine & Smelter Supply Co.[3], 1422 17 St., Denver 17, Colo.

Utah-Idaho School Supply Co.[1], 155 S. State St., Salt Lake City, Utah

Z.C.M.I. Stationery Div.[1], 51 S. State St., Salt Lake City, Utah

[1] Member National School Service Institute; [2] Member National Association of Visual Education Dealers; [3] Laboratory Supply Distributor.

DESIGNING BEAUTY INTO THE EDUCATIONAL BUILDING

By LAWRENCE B. PERKINS

Perkins and Will, Architects, Chicago

Mr. Perkins secured a Bachelor of Architecture degree in 1930. Since then, he has designed school buildings with the firms of Perkins, Chatten and Hammond and General Houses, Inc., and is now a partner in Perkins and Will, Chicago. He is a member of the American Association of School Administrators and the Committee on School Lighting, Illuminating Engineering Society.

SCHOOL planning of the last twenty years has made progress. Thanks to plumbers, steamfitters, electricians and glass manufacturers, our buildings are better in many ways than those of the first quarter of this century. This is a splendid achievement, and credit goes to tens of thousands of devoted people; but the perfect school building is still far beyond the horizon. The purpose of this article is to suggest that we are not moving as fast toward that remote objective as we might, for lack of an ingredient. That ingredient goes by various names, such as architecture, order, design, and others which are summarized in the indefinable word—beauty.

Many other types of buildings are ahead of schools in this regard. For instance, it is no longer an insult to say that something looks like a factory. Most of the plants erected as part of the war effort are more satisfying to look at and be in than most schools built during the same period. Modern man has produced few more noble efforts than the gossamer of steel and glass within which men and women built airplanes near Detroit. The vast assembly floor of the Willow Run bomber plant by Albert Kahn provides a sweep and setting for activity which transcends mere functionalism. It is only a partial explanation of the emotional quality of this and many other industrial buildings to say that each met a studied need. Somewhere among the minds that conceived and executed such buildings were those which valued the comfort of the mind and spirit as well as that of the body. Keeping the rain off and the heat inside was not enough. The lacework of steel with light pouring around it is graceful, rhythmic, and satisfying. Its aesthetic effect is anything but accidental.

Small retail stores have been worked on for generations, and one would think all the solutions had been found. It would be difficult to think of a problem leading more quickly to a pedestrian solution than a shoe store. However, the conditions of competition being what they are, there is a shoe store on Fifth Avenue in New York by Ketchum, Gina & Sharp where the owners paid for and got a store so beautiful that its mere simple artistry is an instrument of that competition. I know of no schoolroom in this country which is as beautiful as that shoe store.

Wiser Buyers in Industry

It is ironic that the builders of dams, power plants, railway terminals and apartments, as well as factories and stores, have, on the whole, been more discriminating buyers of architecture than school people have. Examples in each of these categories can be found which surpass most so-called better school buildings. These builders have shown themselves able to secure the services of people who could deliver buildings which did more than "work." Let's face it—the best minds in architecture on the whole are applied to fields other than schools. School architects have few notable buildings to point to in comparison to the above listed "practical" structures. The reasons the better men are elsewhere are presumably two—discriminating demand, and money to back it up.

No formula can insure superior performance. I have written for these pages in behalf of the "func-

tional" approach to school planning. I meant it and still do. In effect, this approach says that anything that does its job extremely well with great economy and directness will probably be beautiful. But only probably, not certainly. For instance, a girl can possess a nose suitable for breathing, faultless vision, thirty-two teeth, excellent circulation and digestion and still be downright unattractive. Sadie Hawkins and Miss America may be each other's equal in all of these qualifications and still establish a tremendous premium for fortuitous minor advantages in arrangement.

Community planning is good—very good—as far as it goes. It accomplishes several things. Public support and understanding is a direct outcome in most cases. It provides a source of ideas based on first-hand experience. Teachers can be articulate about closets, and janitors can ask for room in front of the boilers to change tubes. The character of a community and its aspirations can be stated—and that is valuable. However, unless blessed by gifted chairmanship, this can degenerate into an averaging process. Democratic planning can prevent mistakes, but cannot *of itself* create a better than inoffensive building.

No grave could be more vigorously jumped upon than the grave of "monumental" school architecture. Plenty and more has been written to say how the writer and all his friends will never, never do such a thing! They will forswear marble columns, in order to spend the money on the inside for better teaching space. They won't build monuments to the school board (although a modest plaque is permissible). They say that fancy cornices, labor-consuming brickwork and bronze grilles in the doorway detract from rather than add to the service of its occupants. They are absolutely right. They are so right that they haven't had a vocal opponent in years. They hope that the victory to which they have won complete lip service from architects and educators alike will initiate a new kind of beauty in school architecture. Their hopes are certainly well-founded in a negative sort of way. Permanent beauty in a building cannot be achieved unless they have succeeded, but it can still be lost if they do. Avoidance of expensive junk must be supplemented by the artistry which permits the Duchess of Windsor to dress more simply than less highly placed mortals.

Permanent Appointment Has Disadvantages

The school architect and the school plant specialist are well entrenched. Going around them takes conviction and political courage in many instances. They, including the author, have consciously nurtured a belief that designing a school is an experience different from all others; that a body of subject matter is involved that can only be mastered by spending several years in the type of consecrated contemplation usually associated with a Tibetan Monastery.

This belief is not wholly unfounded. There are things to know and objectives to understand—but as any educator knows, possession of a fact is far from synonymous with understanding its implications and possibilities. A large factor in the mediocrity of school buildings is the introverted insistence on the employment of "school" architects. They are undoubtedly superior to the mine run of architects with local or political connections, but they desperately need the pacing effect of some competition from the more important offices producing high grade architectural design.

School architects have dragged themselves down into ordinary design by looking into their own past and their own file drawers for their next building. They have—many of them—failed to keep stimulated by fresh phases of the old problem and by fresh work being done in other fields. School consultants coming into the building field via education also contribute to the mediocrity of school building design. They are no more free than architects from the mental tyranny and limitation of what has been. Their function has been to prevent mistakes, which is no small objective, but they have failed to impart inspiration to the architects whose limitations they compound. The closest parallel field is in hospital construction, which has become closed to all fresh influence to the point that almost no distinguished architecture is being produced—at a time when hospitals are being built as never before. So it seems that knowledge and specialization of experts isn't a panacea either.

Anything New May Fail Sometimes

Many cultured proponents of modern architecture have made colorful promises regarding the new day when tradition no longer dominates, and pure non-stylistic design holds sway. Equally cultured opponents urge respectful employment of the idiom of Christopher Wren. They say that if you stick with Wren or Bruneleschi or Ictinus you know it's going to be good, and modern is unproven.

The fact is that either side can produce failures and each frequently does. Each of those great designers was a radical and an experimenter in his day—and had his share of failures. The Duomo in Florence, which was the launching point of Italian Renaissance architecture, has some very unpleasant and awkward aspects to its interior. If the current mode—variously called modern, moderne, modernistic, contemporary or functional—is in fact a vital cultural movement comparable to the Renaissance, it is entitled to its gropings and failures. It is asking a lot of the human mind to go quickly from the idiom of stone and brick which has been the sole vehicle of serious architecture for thirty centuries into an assured and clean-cut handling of media which did not exist fifty years ago. However, we would be cowards indeed if we did not try. This applies to school design—neither the modernist nor the traditionalist will necessarily produce a successful school building. A talented traditional architect can beat a stupid modernist every time—and vice versa. However, it is probably true that the traditionalist is carrying the heavier burden of proof for the load of stylistic idiom, proportion and thinking he imposes on a problem of housing contemporary education. For instance, a window divided into many small lights is stylistically pleasant but an anachronism in terms of modern glass manufacture. Lighting fixtures made to resemble whale oil burners are an awkward way to exploit the possibilities of electricity.

But what can you believe in? If community planning is fallible, the functional approach limited, the

employment of specialists deadening, the traditional approach inefficient, and the modern one fumbling—what then? How can a good school building be achieved every time? Or can it?

Take a Leaf from Industry

Perhaps a reason that corporations can buy better buildings than school boards is the corporation's more limited objective. Profits are much more easily understood and measured than well-informed and emotionally balanced children. It takes quite a public relations program to convince taxpayers that children are valuable enough to spend money on. Another reason which may have a more direct lesson is the comparatively simple line of authority in the corporation. The executive reports to a small group of directors, who, in turn, scarcely feel the influence of stockholders except in the most perfunctory way. The much more complicated job of pleasing all the voters of a district leads to compromise. An administrator who is not paid enough to stick his neck out, reporting to a board which fears criticism, is a set-up to invite mediocrity.

Perhaps the best bulwark for a program of action is a public relations program between the schools and the public which will create an atmosphere in which vigorous and creative people can work. Certainly the fundamental of the whole problem is to select people who will use such an advantage. Boards have ways of discriminating between administrators of equal apparent qualifications. Administrators, in turn, can tell a good teacher from one who merely has degrees and experience. Similarly, boards and administrators must select professional help—not defensively by the number of other boards who have made the same mistake. You don't ask a presidential candidate to govern some other country first before he goes to work for us. Similarly, you are interested in what your professional can do for you in the one particular instance under consideration. You should also do a little soul-searching as to whether you want good work done for you—or merely wish not to be bothered.

No Formula for Perfection

This author does not know how to legislate people into being talented. We find that the best specification we can write won't make a poor plasterer into a mechanic or a bricklayer into an artisan. No formula can do more than channel the talent that already exists in professionals who serve the planning process. This is not the counsel of defeat. Quite the contrary. It is a plea for higher standards of personal performance by the planners, both professional and lay. It is a plea for a more demanding and discriminating clientele in school architecture—boards who are not afraid to insist on buildings which add to the cultural and emotional environment of children. It is a plea for the joyous exploitation of sunlight, color, space and mechanics to draw children to their full stature. It is an invitation to "outsiders" to come in and pace a slow field—to the end that more people will grow up amid beauty.

THE NEED FOR PLANT RESEARCH

By WILFRED F. CLAPP

Assistant Superintendent in Charge of School Organization and Plant
Department of Public Instruction, Lansing

Mr. Clapp followed the usual line of progression in his education career—teacher, principal, superintendent—in six short years in Ovid, Michigan. In 1937 he became consultant in curriculum and instruction in school plant planning for the Department of Public Instruction in Michigan. During the war he was senior specialist on school facilities for the U. S. Office of Education, making surveys of school needs in war connected areas in Illinois, Indiana, and Wisconsin.

SCHOOL buildings cost a lot of money. They always have and they always will. Once built they will remain where they are and largely as they are for many years to come. They will affect the educational welfare, the health, and the very lives of all the children who pass through them. It is important, then, that they be well planned and well constructed. It is important that those who are planning these buildings have at hand up-to-date, reliable information about all the matters having to do with the construction of the building.

This points to the great need for reliable research in this field and for making this research readily available in usable form to school administrators, architects, and engineers. Such research should be conducted, financed, and reported on an entirely non-commercial basis. Whenever research is subsidized by a commercial interest, the results obtained are always open to question. It is always suspected, rightly or wrongly, that the researchers were primarily interested in obtaining data to reinforce conclusions already reached or claims already made for a product and that, sometimes, all the data are not published or given equal emphasis.

It therefore seems necessary that there be a nation-wide, independent agency or project set up in this field. Financial means for such a project might well be supplied by one of the foundations. The total school building needs of this nation are estimated to be some 15 billion dollars. If such a project could furnish information which would result in the construction of better buildings during the coming school building period, what a tremendous contribution it would be.

Let us mention a few fields in which research might yield profitable results.

Visual Conditions

Recently emphasis has been shifting from "how much light do we have" to "how well do we see." Brightness control, brightness balance, and brightness ratios are terms now frequently heard. Various figures are given by various individuals and publications as to what brightness ratios are acceptable for efficient and comfortable seeing. We hear from one source that the brightness of a light fixture should not be greater than twenty times that of its background. From another source we hear that this ratio should not exceed three to one. One publication states that the ratio between the visual task and the brightest area in the visual environment should not be greater than one to ten; and between the task and the darkest area, five to one; a total ratio between lightest spot and darkest spot of fifty to one. Others claim that this can be reduced materially and that fifty to one is too great. What is right and what are the conditions which will make possible efficient and comfortable seeing? Much research needs to be done here by a non-commercialized agency. The results of existing research need to be checked and given publicity, if reliable.

We have seen recommended foot-candle intensities increase from below 15 to 15 to 30 and now some authorities are talking about intensities of 100 foot-candles and over as being needed. Where is the end? What is reasonable? How much light is actually needed in the average classroom for comfortable and efficient seeing? How much is needed in special

rooms? What reliable data are there to support these recommendations? Will a building wired for six watts per square foot prove to be underwired in a few years, as many of our present buildings are today?

What about natural light? We have stated that the net glass area of a classroom should be at least 20 per cent of the floor area. Where is the scientific basis for this? Should it be 18 per cent, 22 per cent, or 25 per cent? What about the rule of thumb that a classroom unilaterally lighted should be no wider than twice the height of the glass in the window wall? Is there proof that this is right?

How about orientation? Traditionally we have said that east and west orientations are more desirable, at least with traditional fenestration. Yet some teachers state that they prefer south rooms. Others claim that north is not so bad after all.

What are the facts? How can they be tied in with our principles of brightness balance?

Bilateral lighting schemes are now being seen more frequently in plans for new construction. California has demonstrated the advantages of such design for that state. How practical is this for the colder climates? How much glass area is needed in a clerestory section? What are comparable construction costs of this sort of building? What are the facts regarding maintenance and heat loss in colder climates? Do the advantages of more natural light, better distribution, and freedom from restrictions on classroom width outweigh other possible maintenance and operating problems?

How can we best control natural light? Can we design a classroom so that children can sit in any position in the room and have visual comfort? What possibilities do fixed vertical or horizontal louvers have? What are the facts regarding glass blocks of various types? How much of the incident light do they transmit? Is shading necessary? Are they too bright at certain times of the day to make possible good brightness balance? What maintenance problems are there? What advantage do they have over single glazing in reduced heat loss?

Heating and Ventilating

What are the facts regarding radiant or panel heating in schools? How much is needed in the colder climates? Is supplementary heat necessary under the windows? What are the facts regarding installation costs, maintenance costs, and operating costs? What beneficial effects does radiant heating have on the health of the occupants? Can room occupants really be comfortable at lower temperatures? How adaptable are controls to fluctuating outdoor temperatures? Under what conditions is mechanical ventilation necessary?

Building Costs

Is there any practical way of overcoming high building costs? What possibilities are there in lighter, "dry wall" construction? Can we cut costs without sacrificing other desirable objectives?

Similar questions might be asked regarding color and room finishes, acoustics, ventilation, size and arrangement of classrooms, arrangement of building parts, optimum size of buildings for children of different ages, floor materials, and any number of other aspects of the school building.

Answers to some of the above questions are no doubt already available. If so, they are not generally known to school people and architects. It is also probable that some answers which are available are given by sources with a commercial bias, and that others which we have accepted for many years cannot be defended scientifically.

Directions of Research

It would appear that there are two general fields of activity which a research project might undertake. The first would be the gathering of information about research already done in fields related to school building planning and construction. While this material is now available theoretically, it is not in such form as to be of maximum use to the field. If it could be gathered in one place, evaluated, condensed, summarized, interpreted, checked as to reliability by a trained staff, and then published, it would be of tremendous help. This would simply be a matter of finding out what we now know and making it applicable.

The second major field of activity would be that of new research. Much of this might be done in existing school buildings with the cooperation of interested school people. Other research could be stimulated in publicly supported scientific laboratories. The agency or project would point our areas in which more scientific data is needed and arrange for it to be obtained.

Much benefit could be derived from the construction of experimental school buildings, and the carrying on of careful studies of health, safety, instructional efficiency and costs in those buildings. Would it not be possible to try out, on a small scale, new construction methods? Perhaps these buildings (a few rooms only) could be so designed that they could be erected from prefabricated materials, used for a year or two, studied carefully during their use, dismantled, and re-erected with different features. In such buildings different orientations, different methods of fenestration and natural light control, different color schemes, and different systems of artificial illumination could be studied. Different methods of heating and ventilating could be tried with variations as to the amount of heat, humidity, and air changes.

Such a building would probably be located close to university engineering laboratories, but operated as a regular part of a public school system.

Would not such a project yield helpful results? Its cost would be considerable and assurance needed that finances would be available on more than a temporary basis. Certainly its contribution ought to be such as to pay for the project many times over.

PLANNING PROBLEMS OF COLLEGES AND UNIVERSITIES

By CARL FEISS

Director, School of Architecture and Planning, University of Denver

Mr. Feiss is a graduate of the University of Pennsylvania and the Massachusetts Institute of Technology, receiving the degrees of Bachelor of Fine Arts in architecture and Master of Planning. In 1937 he took charge of the planning and housing division of the School of Architecture at Columbia University, and in 1942 became an instructor at M.I.T. until his present position at Denver University. His favorite pastime is cooking.

COLLEGE and university administrators and their architects now in the process of studying plans for improvement and for the expansion of their institutions are beginning to realize that a general plan for physical development or re-development is essential to the smooth functioning of the educational program.

Thomas Jefferson recognized that a good plan was axiomatic to the needs of his institution at the time he launched the University of Virginia. From time to time the founders of other educational institutions have recognized the need for a physical plan, and we find Union College at Schenectady, Columbia University, Leland Stanford, the University of California at Berkeley, and numerous other institutions laid out according to master plans by the well-known architects and planners of the day. It is also possible to cite many other institutions developing during the same years which grew without plan, or which, if they had a plan, allowed it to disappear in a welter of chaos-created conditions nearly impossible to rectify except at great expense.

Unfortunately, it is impossible for most of us to start from scratch or to create a new university out of whole cloth, as happened at Duke University. Almost every institution faces a compromise with its past in order that it may not compromise its future.

Today there is scarcely a college or university in this country which is not contemplating expansion plans. Foundations and potential donors have been flooded with brochures picturing the architectural futures of various institutions if the required millions of dollars can be obtained. Usually these flossy brochures include a map or "Artist's Air View" of the existing campus with proposed new buildings conspicuously located within the existing building layout, although in most cases these new buildings are only tentatively located. There is a continued and universal fear of jeopardizing a possible future gift from a donor who has a specific building in a specific location in mind.

It should be clear that I am not advocating the abandonment of potential donors. On the contrary, I believe that the potential donor should be recognized as part of a changing and flexible plan. He forms part of the climate within which the campus is built and he is as variable and as unknown as many of the other problems facing the educational planner. Once an institution is convinced that a plan is necessary, however, its convictions must be strong enough to prevent undue emotional influences or motives of expediency from wrecking a sound educational concept.

From the infinite variety of kinds, sizes, and shapes of educational institutions and educational programs throughout this vast country, the campus planner has difficulty in finding a common formula. Within this infinite variety of physical plant there has grown an equal number of attitudes toward educational programs. The aims and objectives of no two institutions are the same, other than the word "education" itself, a portmanteau word of any interpretation. Since this very general word "education" is held in common, we like to assume in an analysis of a general physical planning problem for all such institutions that education comes first. It is regrettable to have to say that in most campus planning this has not been the case. Architecture seems to have come first.

Higher education has been ensconced for many generations now in imitations of medieval and Georgian coffins, and it has been fighting for light and air and freedom to get out of the tombs in which it has been prematurely buried. No one has been able to explain rationally why it is necessary to take our young men and women out of today's sunny modern high schools and sequester them in medieval cloisters of 18th century Georgian courts in an atmosphere foreign to their past and alien to the future.

If we are to assume that American higher education has reached its ultimate goal and is now static, then it is reasonable to assume that we are building permanent monuments to our dead intellectual selves; but if we feel that there are still a few reasons for remaining dynamic and alive in our educational system, then our plans for the development of colleges and universities must remain alive also. The physical planner of educational institutions is faced with a challenge of creating a structure as flexible and dynamic as the educational program he plans to house.

This challenge has been met by very few for two reasons: first, because of the rigid concept that the building is more important than the educational program; and second, because the educator has been unable to determine the future academic program to the extent that it could be resolved into physical terms. The result is that over and over again an unrationalized and indeterminate educational program has caused the construction of unreasonable buildings in incorrect locations. No matter how brilliant the campus planner, if he does not have an educational program to plan for, he cannot do a sound job.

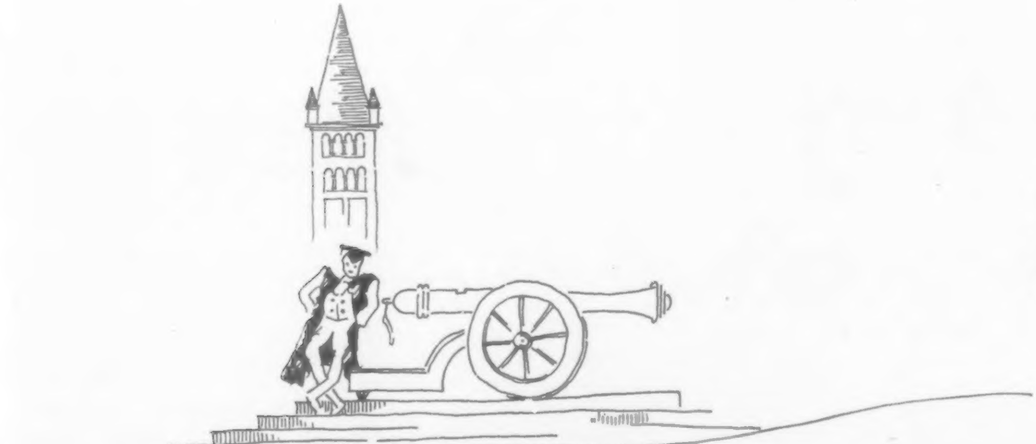
The reason for emphasizing here the question of architectural style and the handicap of our habits of eclecticism is that these have had such a detrimental effect on a flexible educational program. The primary question is a simple one. Are American institutions of higher education going to continue to imitate the physical plant of medieval and Renaissance Oxford and Cambridge universities? If they are, then the educational program planners would be wise to adjust their plans to the re-creation of educational systems similar to those for which such architecture was originally intended.

Planning Climate

The university planner must consider two kinds of climate—the climate of wind and weather, and climate of opinion and emotion. Both are important, although the latter probably has greater influence on the plan than almost any other element. The university complex is largely an emotional one. It contains sentiment about "Old Main," about the "Old Grad," the "Old Prof," the "Old this and that." Much of the sentiment which permeates the campus also permeates the campus plan, the trustees, the faculty, and the educational program.

The proud father of a Princeton freshman recently told me that the boy returned to him after the first term and with tears in his eyes said accusingly: "Father, how could you have ever considered any other university for me?" Within three months the boy had achieved his full measure of emotional devotion to the institution, which he will probably retain in one form of loyalty or another for the rest of his life.

The campus planner knows from sad experience the blizzard's wrath which he faces if, at any time, he breasts the climate of sentiment surrounding such inanimate objects as fences, gate posts, fire plugs, trees, steps, Civil or Revolutionary War cannon, bell clappers, the foot of a bronze statue, and innumerable other objects of adoration and veneration. No campus planner would dare eliminate some structure or part of the campus which is mentioned in a campus song sung at football games or commencements. The ivy covered walls, the shady elm-covered walks, the dim corridors, the obscure nooks and crannies—each one carries with it some memory hugged to the highly emotional bosom of the old grad. Not only must the campus planner respect such traditions, but he should also consider the wisdom of created areas or spaces or items which will further engender similar emotions about his plan for future generations. This is not sar-



Dare the campus planner ignore the tradition of bell clapper, cannon, and bronze statue?

casm; this is a frank recognition of one of the most pertinent facts about any institution's planning.

Buildings are for people. Universities and colleges are occupied by young men and women during a highly formative period of their lives. This is a time during which they are free to a large extent from certain responsibilities of adulthood which make this period, in their later memories, a glowing utopia of the past. Each return to the campus on Alumni Day or on any other occasion requires a re-identification with some person or object which revives a memory of a particular time or event. The more the planner recognizes this necessary symbolism in the development of the character of his plan, the happier the inhabitants of his buildings will be, not only during their occupancy, but in the years to come. A purely mechanical campus plan or a dry building design can never achieve this element of normal human relationships between the building and the man. A wise and able planner will be able to achieve the happy combination of function and opportunities for such healthy and natural human emotions.

What Belongs in a Master Plan

Perhaps we had better insert here a definition of the word "planning." Planning is a continuing process and we must recognize it not as a single element in time, but as a process. Such a process contains within it a number of procedures: (1) the identification of a problem; (2) research and the identification of all facts possible about the problem; (3) the summing up of the facts and the drawing of conclusions from it; (4) the preparation of a plan from these conclusions; (5) the programming of action which will put the plan into effect. Being a continuing process each one of these elements of the process is continuing in itself. No man can prepare a campus plan without recognizing the fact that universities are continually changing and should be permitted to change as educational ideas will change. The very fact that there is a continuing turnover of faculty and student body, as well as administrative officers and trustees, makes the very nature of the plan on any campus a flexible and in some cases, even a transitory thing. At any one point in time, however, a single decision may become a turning point in the plan and may permanently influence the development of a university. This creates imponderables which make the gathering of facts about an educational program a difficult part of the program preparation and make the complicated problem of preparing the plan even more so.

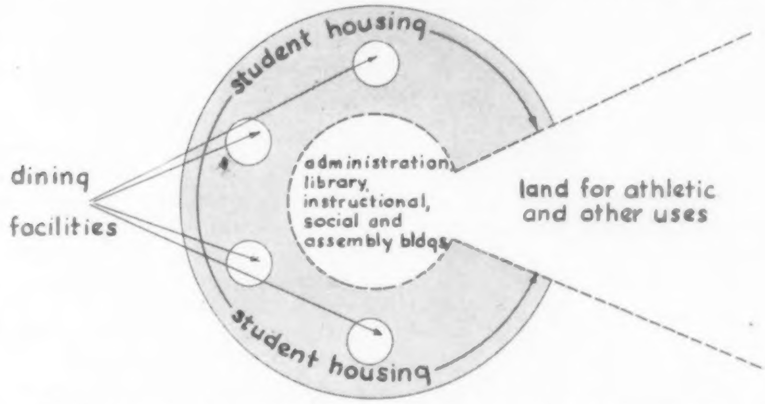
The average person would be surprised to learn how little educational institutions actually know about themselves. They very seldom know about their own curriculums, except from catalogs usually a number of months behind. They very seldom know about the plans or ambitions of any individual department, and from the top administrator down, the campus planner finds it exceedingly difficult to find the firm educational objectives on which to hang the basic elements of his plan which each division of the institution should have. And yet the educators expect of the campus planner over and over again, a rational solution to the educational requirements when he, the educator, has not been able to resolve in his own mind exactly what he would like to recommend. No amount of guessing on the part of either a faculty member or the architect-planner can satisfy the future needs of the institution in a sound way.

One of the ways of helping the situation is that of gathering all the facts possible about the campus physical plant. It is always astonishing to find how few institutions have an accurate survey of their campus and the area around their campus which it influences and which, in turn, influences the institution. Few educational institutions have plant plans, utility plans, topographical maps; few have complete data or drawings on campus buildings, or if they have them they don't know where they are or have not kept them up to date. Part of the architect-planner's job is bound to be research into the existing structure of the campus community.

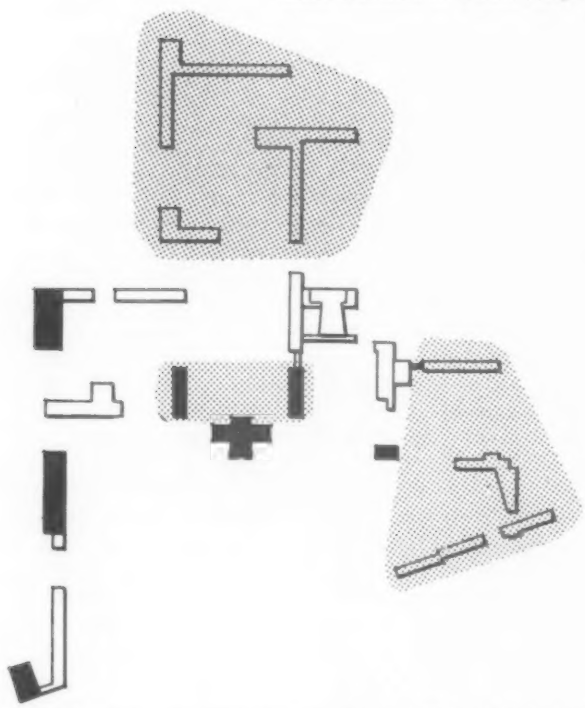
Starting with what there is in the way of physical plant, it is always necessary to check what the faculty and administration think is needed. Every faculty member and administrative officer should be warned that what the architect-planner wants is not important. The architect-planner must not be permitted to let his egotism get away with what the campus needs. He is never as important as he thinks he is. There are only three important elements of any campus plan: (1) the arrangement of buildings satisfactory to the educational use to which they are to be put; (2) an orderly arrangement; and (3) harmony between the buildings on the campus, old and new, and between the campus and the community in which it is located. If use, order, and harmony are combined properly, the plan will be successful and will remain rational and flexible over many years. Any attempt to inject artificial architectural symbolism or force a style or pattern upon these three elements will interfere with sound planning and will date such planning in the eyes of the future. Obviously, the use of buildings depends on the educational program discussed above, and the orderly relationship between buildings will develop from this same program. The harmony between them which is created in the plan will depend upon the skill of the architect-planner to weave into the complexities of his plan the multitude of old and new elements with which he is working. This will include determining what is to remain a permanent part of the plan and what is to be temporary.

No illustration of existing university campus plans for the future is presented here because (1) no plan of any one campus can be adopted by any other; and (2) any attempt to recommend a plan would require an explanation of the corollary academic program from which the plan developed. However, under no circumstances, in my opinion, would it be wise to seek other formulae in lieu of making your own decisions for your own institution. The form of your building grouping and of your buildings themselves is only incidental to the educational and psychological requirements of the people who are to use these structures. No campus architecture, considered in terms of form only, means anything. We should recognize here that in making this decision, recent phases of imitating the past can be considered as much the heritage of the past as those remaining buildings which are authentically ancient. If we recognize that collegiate Colonial, Gothic, or other architectural hybrids are part of a psychological period in which educational institutions attempt to look older and more intelligent than they are, we are recognizing that this

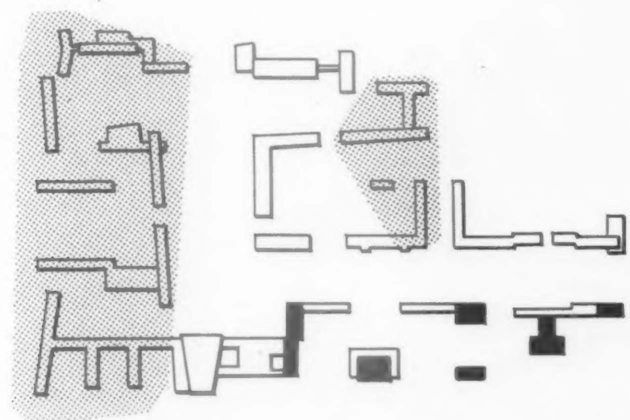
Campus plans by Saarinen, Swanson and Saarinen, Architects, Courtesy Architectural Record.



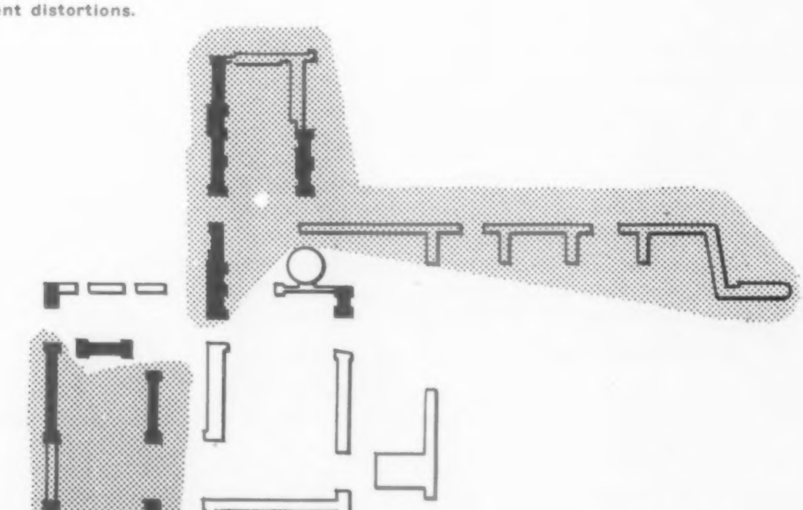
Basic elements of a university as a "community within a community."



Antioch College plan; some basic elements, different distortions.



Drake University, existing and projected. Student housing shaded.



Stephens College, early planning stage.

is part of the heritage of this institution on which our descendants will look, we hope, with amused tolerance. Since nearly all of our educational institutions today face campus planning decisions involving such structures, every attempt should be made to recognize that they often have high salvage value and that it would be financially, as well as politically, unwise to consider the demolition of such structures. They therefore become part of the campus plan as much as its topography, its climate, and the community in which the campus exists.

The Flexible Plan

Many campuses today have plans which have been adopted in the past and which are still adhered to, despite changes in campus requirements. In any discussion of flexibility to meet new educational needs we must decide on the permanency of installations, and the life of buildings becomes a pertinent factor. Up to now there has been an almost universal concept that buildings must last as long as the life of the institution. Even recognizing the emotional value of the elderly structure, the plan must be rational enough to eliminate unnecessary over-weight on the side of such emotion in favor of necessary flexibility of the educational program.

In the technological society which we are attempting to enjoy, the long life of buildings, particularly those used for scientific study, is not necessarily as important as their flexibility. Modern techniques of construction provide for types of desirable impermanence not possible even 20 years ago. Rapid progress in scientific achievement, constant change, and new demands upon the technology of architecture and engineering indicate a new concept of academic architecture. Even such normally musty halls as university libraries are requiring new engineering and architectural principles of design, and in a few years it may be possible for us to conceive of libraries which are as well designed as the standard metal flexible unit book stacks which are so often jammed into inflexible medieval halls. Some day libraries may even be lighted well enough for reading.

We know today that there are no firm concepts of the technology of campus layout. The controversy between the central heating plant addicts and the unit heaters continues to rage. Lighting of buildings and the campus as a whole has moved within ten years from the incandescent bulb through the fluorescent to the cold cathode and from there . . . ? Any structure which will require a variety of mechanical services today has to be built with maximum flexibility or impermanence in order that tomorrow's inventions may be adapted to tomorrow's educational needs. Perhaps at this stage of our inventive genius, it would be wise to consider such structures as temporary.

The Campus Plan and the Community

One of the main reasons for not recommending any specific plan is that no two universities or colleges are located in the same place in a community. We have to recognize in our campus planning that a campus is a small community within itself and that in its planning it contains almost all of the elements contained in the average community plan. In preparing the program for any campus it is necessary to consider internal and external functions of the plan which are identical with the job of any municipal planning commission except on a more limited scale. The design of housing and residential areas, traffic, parking, recreation, utilities, health, and administrative buildings, enter into the picture and their logical location is related not only to the physical and legal confines of the institutions, but also to what goes on outside in the surrounding areas. It is wise to recognize the fact that the campus does not stop until its last influence is felt in the community.

Our campuses are all surrounded by quasi-educational institutions, such as rooming house districts, fraternity districts, restaurants, student supply stores, innumerable types of recreation and other types of business—all of which are satellites in the educational galaxy. The university has a responsibility to its students in seeing that these areas and uses of land in the vicinity are considered as part of the plan, even though institutions' jurisdiction over them may be limited. If the university exists within a community which has an active city planning commission, it should request that the university be integrated with the city plan and its laws and ordinances. Certainly no urban university can forget that its campus or campuses must grow and develop with the community in which it is located. Otherwise, it can either be swallowed up in the community and lose its identity, or it may be faced with problems of community development which will adversely affect the character of the institution.

Today there are no Chinese walls that can be built around an urban university to protect it from the city within which it is located if the city's development requires such protection. This problem is seldom serious in smaller cities, but it is always a potential menace. Those colleges and universities that are fortunate enough to have been the reason for the creation or the extension of the community in which they live also have a planning responsibility to that community and should in their campus planning consider that the community's plans are part of its job. No institution that I have been able to find, irrespective of mental attitude, exists in a physical vacuum.

Who Should Make the Plan

In order that there may be an assurance that educational policy comes before architectural plan, it would be wise at all times for each institution, regardless of its size or type, to assign faculty and administrative officials to a committee with the responsibility of developing the planning policy. Such a continuing committee or board will go a long way toward saving money for the institution and toward clarifying major academic issues and general public relations policies. Too often in the past a change in top administrative personnel has broken continuities in the development of objectives. Such a continuing committee can go a long way in providing the necessary continuities of thinking and action, despite personnel changes. Any attempt to use a fixed and dated physical plan or drawing called a "Master Plan" without a policy committee may prove a fatal error. Such a drawing becomes in the minds of faculty, administrative officers, and alumni as fixed and inflexible as other campus monuments. In fact, such a plan without continued supervision and revision may be more danger-

ous and damaging to the future of the university than no plan at all. Only its continuing administration can keep it alive and useful to an institution if the institution itself is to remain alive and useful.

In order to meet this situation, it would be wise for the institution to give to its development committee sufficient funds to provide a permanent staff member or a permanent consultant to the institution, depending on its size and the funds available, to whom the committee may turn for technical interpretation of the academic program. I am not advocating here any one administrative form, since much depends on the size of the institution and its ambitions, but I would like to warn against the blitz consultant who arrives for a quick survey and to collect his fee. I would also like to warn, at the same time, against the long distance planner who, because of a reputation, often well-merited, has been employed by the institution and who visits it only occasionally. There are a number of variables possible in the handling of responsibility for planning, but whether it is a campus architect-planner who does the job, a consultant, or any other individual or firm who is responsible for the technical job, the committee should be held responsible for all basic decisions on policy and program. It is a continuing problem and sporadic attacks upon it will obtain only superficial results.

How the Master Plan May Be Financed

Since continual operation of a functional plan requires financing, it would be wise to consider the costs as part of the budget of the executive office of the institution. In most instances, the planner should be employed in the executive offices and be directly responsible to the institution's chief executive through the development department, if such a department exists, or through a committee of deans or department heads with whom he must work at all times in order that every change in academic policy may reach him immediately.

There should be no confusion between the planning office and the business management office, as these are two separate functions. The planner should not be bogged down with details of the existing structure. The only exception to this rule would be at points where a major repair or alteration of an existing structure is weighed against plans for a new structure, or where alterations would interfere with the flexibility of the general campus plan. The future of the university is safeguarded by the importance which the institution places on its own future. This cannot be weighed in terms of money, and certainly the funds wisely expended on the future will return much more in value.

In conclusion, I emphasize, the university plan is a living thing—a combination of two types of knowledge—a knowledge of educational methods and the means of physically housing an institution in which the educational methodology has been worked out.

In our dynamic and changing world, the demands on a university are also dynamic and ever-changing. We are replacing the cloisters with the cyclotron, but in the process, we must not make the mistake of those scientists who may have, to quote Launcelot Hogben, "ignored the social consequences of their own activities."

The master plan of a university is neither a plan for a machine for learning, nor a plan for a memorial to dead brain cells. It is a plan for a dynamic, living, and highly emotional organism charged with the responsibility of training young men and women to see and feel that the knowledge they gain within the university is going to create in them the power to improve their society and themselves.

INTEGRATED UNIVERSITY PLANT PLANNING

By HERMANN H. FIELD

Director of Building Plans, Cleveland College, Cleveland, Ohio

Mr. Field received his education at Harvard and the Swiss Federal Polytechnic Institute at Zuerich. During the years 1934 to 1940 he worked in various European countries as an architect, and studied housing and city planning. He was in charge of research and planning with Antonin Raymond and L. L. Rado, New York architects, before assuming his present duties with Western Reserve.

IN THE '20's we indulged rather freely in the glamor approach of shedding monumentality onto our university campuses with little restraint as to a sense of proportion or to the real needs of the institutions concerned. Thus smaller colleges quite often found themselves troubled by the dominance and the upkeep of an oversize gymnasium, chapel, auditorium, or library, or by a set of swank dormitories. A building was a building, and you didn't look a gift horse in the mouth—until afterwards. Came the depression, these monuments to donor immortality didn't exactly help to keep our colleges solvent.

Since then we have learned a bit, and the emphasis in building has tended to be more utilitarian. We now think in terms of funds for staff and equipment for the development of specific educational and research programs, with structure incidental to them. But even in this there is still discernible a residue of the old monumentality. Too often a new building is something added in isolation, often an accident of circumstances. It may sharply increase an already existing lack of balance in operation and educational program, and cover up a growing paralysis in facilities and educational efficiency at the center of the institution. While the circumstances of donation frequently make sporadic development at the periphery of the institution inevitable, recognition of this makes all the more necessary the compensatory mechanism of an integrated plant development program, taking these very factors into consideration.

At this moment after the interim of the war and with the huge new demands upon educational programs and the physical plant of our universities, there is a unique opportunity as well as a compelling necessity to undertake integrated educational and physical plant planning studies. Enterprises which have grown up over years of change by *ad hoc* additions and improvisations, must take up their potential slack before expanding into new educational ventures and their spatial counterparts. Whether new buildings will result, and what type, is in this sense only one part of a much larger problem.

Three-Sided Approach

I would especially emphasize three criteria as basic to this approach. First, our program of plant development must in itself be a spatial translation of a complexity of factors based on educational planning, operational analysis, community relationships, and the application of science and technology. It must be the expression of a multiple-purpose effort. Involved is democratic teamwork including administrators, faculty, specialists, and citizens working closely with those who are directing the planning. The result is a flexible approach with structure a means rather than an end.

Second, the plant facilities should be considered as a continual overall process in time like our education itself. It is not a matter of adding something new here and leaving the old behind in the shadow, as we have done to our cost and shame with most of our cities. It is a matter of improvement all along the line. Where our existing facilities leave off we add to them, and in such a way that each addition will also

Airview showing Cleveland Civic Center area around the Mall with the Cleveland College Main Building in the middle foreground at juncture between Mall and Public Square. This location with an extension along the west side of the Mall is being considered as the site for the new downtown educational center.

improve what we have chosen to retain of the old. Only thus can we avoid buildings that are new today and headaches tomorrow.

Third, in our research, let's emphasize the overall performance angle based on the analysis of an entire problem rather than of the component products in isolation. We have a staggering amount of special props for our educational plant. In contrast there has been little improvement on a comparable scale in the overall enclosure we call rooms and corridors and halls. They are still largely unaltered hand-me-downs in concept, inadequate in relation to the technological possibilities implicit in the equipment we use. As a result we tend to resort to these props to overcome our design deficiencies, creating over-complication and extra cost. We talk about what goes into the space rather than starting with what the space itself can do.

For example, much more information is needed on the qualities wanted of a room as a spatial, luminous and thermal concept for certain activities. Accurate

Cleveland College Main Building and Auditorium viewed from the Mall.

regard for the correct use of glass blocks, fluorescent lights, insulating materials, teaching equipment, and all the rest of a specification will not add up to it. The standards developed by an integrated study of an entire unit are likely to be at variance with standards collected from a series of isolated components. The

former are also very likely to provide better space more economically. Thus we must beware against the gadget trend and not be glamorized by products, lest we burden our solutions with over-developed elements —a costly procedure. Clearer perception of the essence of the problem will produce more functional and happier results in human terms. These results are beginning to appear first in the elementary school level both in this country and in England. With the smaller scale units it has been easier to depart from accepted form and demonstrate the validity of radical departure in respect to space and light and atmosphere and flexibility of use. Here the achievements of an approach based on a composite of the space qualities and the activities of its users have proved the limitations of standards isolated from each other, especially in the matter of light.

Method Illustrated

The method, stage by stage, of a program of integrated university plant planning might best be illustrated by citing the outline of the specific program adopted in developing a new urban center for Cleveland College. It consists of five main phases beginning with a three-pronged research program about the institution and its environment, the specific aspects of education it deals with, and the design and technological considerations. This research and analysis enables the setting up of clear educational and plant standards which can then be embodied in a plant program and finally in a master plan as the framework for the actual building operations. Listed below is a breakdown of these successive phases:

1. GENERAL RESEARCH AND ANALYSIS
   a. Adult education and urban universities
      (1) adult education aims and trends
      (2) experience record with existing and new plant for adult education institutions
   b. Cleveland College and Cleveland
      (1) educational aims
      (2) operational analysis
      (3) enrollment trends
      (4) community factors
      (5) other Cleveland educational institutions
      (6) plant analysis
      (7) fund raising
   c. Design and technological factors and trends
      (1) planning factors applicable
      (2) architectural expression
      (3) spatial and psychological factors
      (4) types of building materials and qualities desired
      (5) methods of construction
      (6) lighting, air conditioning and other utilities
      (7) equipment: furniture, audio-visual aids, labs, etc.
2. STANDARDS: Conclusions from the research program above as a yardstick for Cleveland College planning. A listing and description of:
   a. organizational and educational standards
   b. space standards
   c. materials, construction, equipment, performance standards
3. CLEVELAND COLLEGE PHYSICAL PLANT PROGRAM: Translation of data above into an integrated spatial organization for Cleveland College based on:
   a. community relationship: role of community facilities, services, etc.
   b. site factors: location, zoning, communication cost, contributary areas, etc.
   c. economic requirements: operational and plant cost
   d. space requirements for educational, administrative, faculty, social purposes, etc.
   e. organizational relationships of space elements
   f. existing plant utilization
   g. technological requirements: materials, equipment
   h. general and specific design requirements, architectural expression
4. A CLEVELAND COLLEGE MASTER PLAN providing:
   a. a short and long term statement of full program requirements
   b. a time sequencing of successive building operations
   c. an integration of existing facilities where retained with new buildings at every stage
   d. a cost analysis and fund raising mechanism
   e. a method for periodic review and modification
5. BUILDING PHASES I, II, III, etc., within framework of master plan, and dealing in each case with:
   a. design and construction of new building elements
   b. modification of retained existing elements
   c. integration with use of other Cleveland non-college building facilities

While this outline grew out of the needs of a specific institution, it illustrates a possible method which, in conjunction with the criteria emphasized earlier, should put us on the road to a more balanced development of our university plant.

UTILIZATION OF COLLEGE AND UNIVERSITY BUILDINGS

By T. C. HOLY

Director, Bureau of Educational Research, The Ohio State University

and RONALD B. THOMPSON

Registrar and University Examiner, The Ohio State University

Dr. Holy is director of Ohio State University's bureau of educational research and is nationally known as an authority on school organizations. He has made surveys of public school systems in Columbus, Cleveland, and other cities as well as state institutions. He started with Ohio State in 1927 as head of the school plant rehabilitation program of the state department of education.

Dr. Thompson graduated from Hasting College in Nebraska in 1929. He completed his graduate work at the University of Nebraska and was awarded an M.A. in 1933 and a Ph.D. in 1939. His appointment to Ohio State University came in 1944. An authority in the field of mathematics, he is author of the text, Remedial Arithmetic for High School Pupils, and numerous educational articles.

IN THE autumn of 1945 there were enrolled in colleges and universities in these United States 952,000 students. One year later that number had increased to 2,078,095, or more than double the number of the year before. According to figures supplied by the U. S. Office of Education, this number had increased to 2,338,226 in the fall of 1947, which number was nearly 2½ times the number enrolled in the fall of 1945, or just two years before. These figures give the picture in brief of what has happened in college and university enrollment within a two-year period. Obviously, the providing of classrooms, laboratories, shops, library facilities and the like for the instructional program and the office space for the greatly expanded staff, posed a major problem for college and university officials. One of the questions which these enrollment figures raise is, to what degree have college and university building programs kept pace with these increases in enrollment? To answer this question it is necessary to review briefly the happenings in this field during the past three decades.

During the decade 1920-30 college enrollment more than doubled in the country as a whole. During that period times were good and money plentiful, so there was a great deal of college and university building done. For example, at the Ohio State University, twenty-two new major buildings were either completed or funds appropriated for them during that decade. Undoubtedly, similar expansions took place elsewhere. However, during the next decade—1930-40—which was ushered in by the depression and during which time college and university enrollment increased by 35.8 per cent, building construction in these institutions, with the exception of that financed in part through the two Federal Agencies—Public Works Administration and Works Progress Administration—was almost at a standstill. Again using Ohio State University as an illustration, during that decade only one major building project was completed. With the outbreak of the war in 1941, even though funds may have been available, building materials were not, so that colleges and universities in 1946 found themselves faced with a problem of accommodating a greatly increased enrollment in a total floor space not much in excess of that in 1930. Though some relief was obtained through surplus temporary buildings furnished and installed by the Federal Government, through its Federal Works Agency, the total amount of such relief constituted only a small percentage of the total floor space.

Use Present Facilities

Referring again to Ohio State University for illustrative purposes, the percentage increase in total floor space resulting from the installation of 150 of the temporary buildings was less than 10 per cent. How then have college and university officials met this challenge of housing an enrollment far in excess of anything in the past? Also, a second question arises in this connection; namely, how well has it been done? In answer to this second question, it is the judgment of the writers, based on detailed information for Ohio State University and observations and information from a number of other institutions, that in terms of

its magnitude, the challenge has been met exceedingly well. Moreover, it has been accomplished primarily through better utilization of the existing plant.

Utilization as commonly defined falls under two headings—room and student-station, and capacity use. In the case of the first, if a room which seats fifty students has a class of twenty-five in it, so far as the room is concerned it is completely utilized, since it is not feasible to have two classes going on in the same room at the same time. However, in terms of student capacity, it is only 50 per cent used.

Analyze Enrollment Figures

Pertinent also, to this discussion is the question of what are future enrollments likely to be? Are present levels likely to be maintained, increased, or will enrollments decline to prewar levels as the veterans, now financed in part by the Federal Government, pass out of the picture? The veteran percentages of the total enrollments in the colleges and universities in the fall of 1946 and 1947 were 52 and 48 respectively. In actual figures this means that of the increase in enrollment amounting to 260,131 between 1946 and 1947, only 42,342 were accounted for by veterans. If enrollments do decline to prewar levels, then permanent improvements ought to be limited to those numbers. Otherwise, colleges and universities which plan their plant programs in terms of present enrollments will find, within the next few years, that they have excess capacity and therefore, poorly utilized buildings and equipment. If these enrollments do decline within the near future, then it seems a far wiser procedure to plan a permanent building program accordingly, and carry the present peak enrollments in the present permanent plant augmented as it has been by temporary space, even though some crowding may result.

Some persons are of the belief that what happened in secondary school enrollment during the period of 1910 to 1930 is in its beginning stages in the field of higher education. Using the 1910 secondary school enrollment of 1,111,393 as 100, the indices for 1920 and 1930 are 224 and 432 respectively. These persons further argue that the educational requirements for jobs which some thirty years ago were at the eighth grade level and later rose to high school level are on the threshold of at least a requirement for some college training. In other words, they believe that in the years ahead the percentage of the total population enrolled in colleges and universities will show a sharp increase. This contention is supported by the "President's Commission on Higher Education" which recommends, according to newspaper reports on December 15, 1947, Federal Aid to the end that college enrollment be increased "to a minimum of 4,600,000 by 1960" as compared with 2,338,226 in the autumn of 1947. Among the reasons for this sharp increase is the need for more doctors, dentists, teachers, and other professional workers.

The trend in college and university enrollment is shown in the figures which have been taken from a study entitled "College Enrollment in Virginia"[1] and show what per cent of the total population was enrolled in college in 1840 and by decades beginning in 1890. It will be noted from these figures that the percentage in 1930 was slightly more than twice that of 1920. Also, that there was a sizable increase in this percentage between 1930 and 1940.

Year	*Total Population in the U. S.*	*College Enrollment*	*Percent of Population Enrolled*
1840	17,069,453	16,233	.10
1890	62,947,714	145,662	.23
1900	75,994,575	225,350	.30
1910	91,972,266	339,282	.37
1920	105,710,620	462,445	.44
1930	122,775,046	1,100,737	.90
1940	131,669,275	1,494,203	1.13
1946	140,000,000*	2,078,095**	1.48

* Population estimates.
** Of this number, 1,080,396 are Veterans.

Employing Emergency Measures

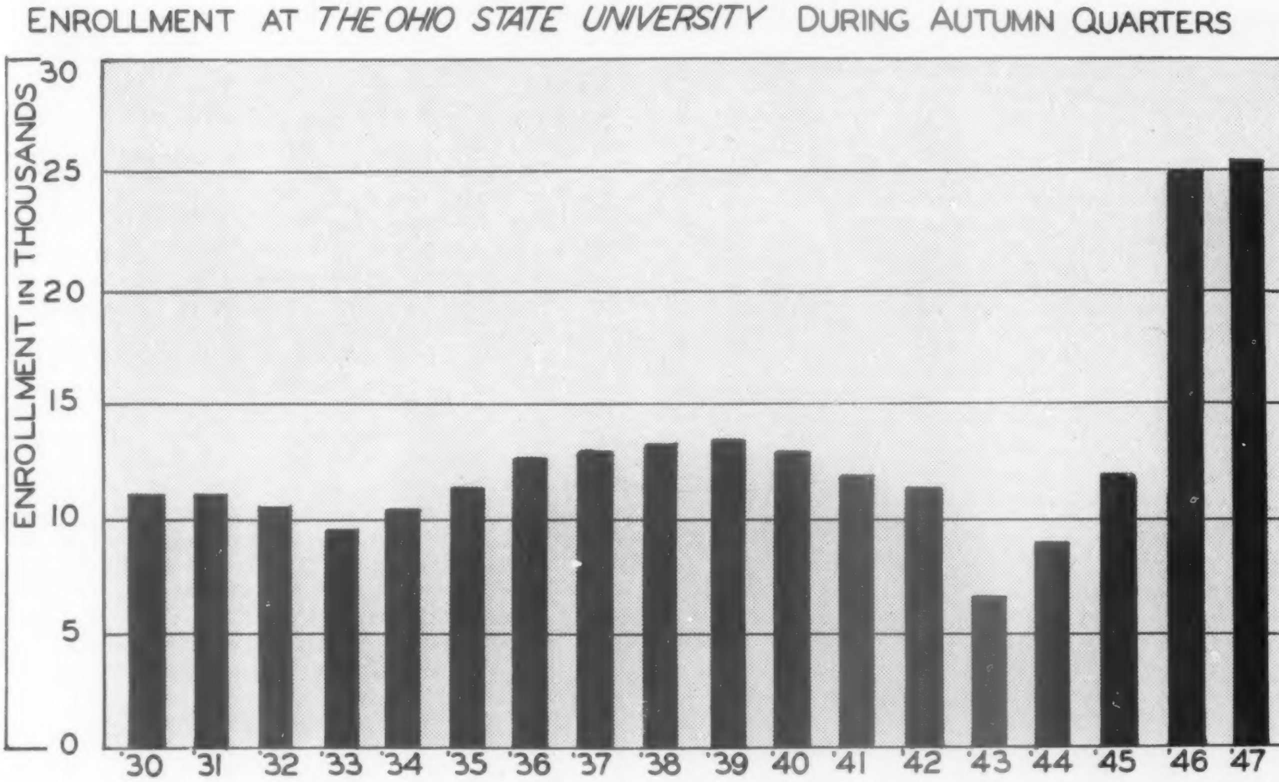
To be more specific, what means have been taken to house current enrollments despite the fact that little college building construction has taken place since 1930? In the materials which follow, a more detailed description will be given as to how one large state university, namely, Ohio State University to which reference has already been made, has met this emergency. To show more clearly what the problem has been, the total enrollment for the autumn quarter of each of the years of 1930 through 1947 is shown at the right. (The year 1930 has been taken because very little new construction has taken place since that date. It will be seen from this figure that the enrollment in 1947 was nearly 2½ times that of the base year of 1930.) Mention has already been made that only one large building project was authorized and completed in the decade 1930, and that the total additional temporary space provided by the Federal Government amounted to less than 10 per cent of the permanent floor space. According to University rule, "the assignment of rooms for classes and other meetings occurring during the hours from 8:00 a.m. to 5:00 p.m." is the responsibility of the Registrar. However, in order to assist the Registrar in coping with this problem, the Faculty Council which is made up of both faculty and administrative representatives, at its meeting in October, 1945, requested the President "to appoint a Committee of five, including the Registrar, to explore the whole problem of building utilization on the campus with particular reference to the scheduling of classes." This Committee reported to the Faculty Council on November 13, 1945, at which time approval was given for the creation of a Council on Class Size and Room Usage. Quoted from the minutes of the Faculty Council are the following, regarding the membership and powers and duties of this newly created body:

"That the Faculty Council today resolve to authorize the formation of a 'Council on Class Size and Room Usage' with power to study and negotiate the issues in respect to class size, hourly schedule, and room usage. Its constitution is recommended as follows:

(a) The Council on Class Size and Room Usage shall consist of nine members of the University Faculty appointed by the President, three to be appointed each year. (At its inception all nine shall be appointed at once, three for terms of one year, three for two, and three for three years. Thereafter, appointments shall be made by the President in September of each year.)

(b) The University Registrar shall be ex-officio a member of the Council and shall serve as its chairman.

[1] John L. Lancaster, College Enrollment in Virginia, Bureau of Population and Economic Research, University of Virginia, May, 1947, p. 1.



(c) The Council shall formulate policy regarding the use of all classroom, office, laboratory, studio, and special assignment space in University buildings and shall make its policies known to administrative and instructional officers. This Council shall also make recommendations to the University Cabinet regarding classrooms, offices, and other space needed for the University program.
(d) The Council shall have power to act in the negotiation of room usage throughout University buildings.
(e) The Council shall receive from the various colleges and departments such recommendations and plans as they may see fit concerning class size and hourly scheduling and shall authorize the adoption of such plans as are compatible with its stated policies.
(f) Decisions of the Council may be brought to the University Faculty Council for review."

At this same meeting the Faculty Council authorized a careful study of the use of the University plant in the manner similar to what had been done during a six-quarter period in the years of 1937 and 1938.

Greater Room-Use Needed

The common practice which has grown up in colleges and universities over the past years is that five-hour classes are scheduled at 9:00, 10:00 and 11:00 o'clock a.m., Monday through Friday, and three-hour classes at the same hours on Monday, Wednesday, and Friday. Although this was generally satisfactory to both staff and students it was at once evident to this newly created Council on Class Size and Room Usage that the mounting enrollments required far better use of the University plant than was possible under this practice. Consequently, on March 11, 1946, they took the following action:

"That this Council declare as a policy effective Fall Quarter 1946 that departments schedule as many courses between 12:00 noon and 5:00 p.m. as are scheduled between 8:00 a.m. and 12:00 noon and that as many three-hour morning courses be scheduled Tuesday, Thursday, and Saturday as are scheduled Monday, Wednesday, and Friday, and that any exceptions to this policy will be made only on request of the department. The department should be given an opportunity to show cause why that policy cannot be followed in particular cases."

During the autumn quarter of 1946, when this new requirement first became effective, the Council made a careful check to see how well it had been observed by the sixty-six departments then in operation. The Council was gratified to find that 1,494 classes, which included both lecture and laboratory, were scheduled between 8:00 a.m. and 12:00 noon and 1,486 such classes were scheduled between 12:00 noon and 5:00 p.m.

Another problem which the Council faced during the early part of its existence was the question of, whose space is it? Does it belong to a college, a department, a staff member, or to the University? Like the scheduling of classes mentioned above there had grown up over the years the belief that long years of possession of certain space make it the property of a college, a department or an individual as the case may be. Although, at the outset, there were a few instances of strong opposition to the position taken by the Council, namely, that all the space on the campus belonged to the University and could therefore, be used to its best advantage, the soundness of that position is now generally accepted.

In addition to the action mentioned above the Council, in carrying out its responsibilities, has taken the following steps:

1. Made detailed studies of the use of all classroom and laboratory space in the University buildings, and the dis-

tribution of classes according to size, for the Winter, Spring, and Autumn Quarters of the calendar year of 1946, and for the Autumn Quarter of 1947. These reports were mimeographed and distributed to University officials, deans, departmental chairmen and directors.

2. Made in connection with each of the above studies, a detailed study of the distribution of class size for each of the departments and class levels, i.e., 400, 500, 600, 700, and 800, levels. These reports were likewise distributed in the same manner as mentioned above.
3. Held a number of hearings regarding space use and space requests and also other hearings regarding the distribution of additional temporary space already authorized.
4. Authorized at its meeting on January 13, 1947, a comprehensive study of present office space, its use, and additional office space needs in the light of anticipated enrollments and expansion of the University's program.
5. Received requests for additional classroom, office and laboratory space in the new temporary buildings and in cooperation with the University Cabinet allocated and assigned the space.
6. Made a number of studies of anticipated enrollment. Also, made several special studies dealing with particular rooms and buildings.

In addition to these steps the Council has set up a Kardex system to facilitate the handling of room assignments in the Registrar's office. A special card has been designed to provide for all four quarters of the year on the same card. Also, one part of the card is designed to provide the basic information needed in making the most satisfactory room assignments.

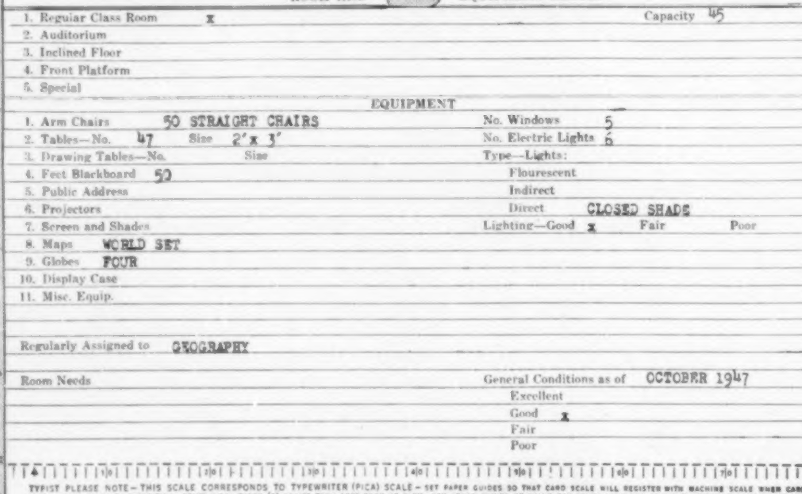
To assist the Council with its responsibilities, a Research Assistant who works closely with the scheduling clerk in the Registrar's office is employed. As an example of his work, the present incumbent—Arthur H. Price—visited every classroom on the campus to get the basic information needed for the card.

Research Shows True Picture

On the whole the writers believe that the work of the Council has been a very important factor in housing an enrollment which doubled within a year. As a specific example of its work, the following is cited. In order to house the large classes made necessary by this enrollment there was strong agitation in the autumn of 1946 to rent a local theater during the daylight hours. In fact, the theater management had been approached and a tentative rental figure secured. The Council took out all the large rooms from its files and studied their utilization separately. It found that they were being used less than 25 per cent of the hours between 8:00 and 5:00 p.m. That information was supplied to the President's office with the result that the whole matter was dropped.

The foregoing materials have dealt with the methods used in coping with this problem at the Ohio State University. Another question which arises in this connection is: what constitutes a satisfactory level of room utilization? To the lay person not familiar with the problems involved in room usage, the goal to be attained would be 100 per cent utilization—that is, every room in use every period of the day. Those who have had experience in the actual scheduling of classes know that this is not a reasonable goal. Unfortunately, in the college and university field, few studies of building utilization are found in the literature. In 1930, Ray L. Hamon, now Chief of the School-Housing Section in the U. S. Office of Education made a study of the utilization of 1,393 instructional rooms in twenty-two colleges located in the Middle West, New England, and South, and the metropolitan area of New York City. Among other things he found that recitation and lecture rooms were used more during the periods before lunch, while the use of laboratories was somewhat higher during the four periods following lunch. He also found a higher utilization in teachers' colleges than in liberal arts colleges, engineering colleges, and state universities.

On the other hand, many utilization studies have been made in the secondary school field. One of the pioneer studies of that was made by E. L. Morphet in 1927. This study included an intensive analysis of the use of fifty-eight junior and senior high school buildings with enrollments ranging from 80 to 3,365 and all of which were regarded as overcrowded. The Bureau of Educational Research at the Ohio State



Building HAGERTY HALL
Room No. 201 Room Size 30 x 50
ROOM AND EQUIPMENT RECORD
1. Regular Class Room x Capacity 45
2. Auditorium
3. Inclined Floor
4. Front Platform
5. Special

EQUIPMENT
1. Arm Chairs 50 STRAIGHT CHAIRS No. Windows 5
2. Tables—No. 47 Size 2' x 3' No. Electric Lights 6
3. Drawing Tables—No. Size Type—Lights:
4. Feet Blackboard 50 Flourescent
5. Public Address Indirect
6. Projectors Direct CLOSED SHADE
7. Screen and Shades Lighting—Good x Fair Poor
8. Maps WORLD SET
9. Globes FOUR
10. Display Case
11. Misc. Equip.

Regularly Assigned to GEOGRAPHY

Room Needs General Conditions as of OCTOBER 1947
Excellent
Good x
Fair
Poor

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Kardex system set up to facilitate the handling of room assignments.

University has recently compiled information on the use of fifty secondary school buildings in Ohio. In those fifty buildings, the average percentage of room utilization of the academic rooms was 85 with a pupil-station use of 70 per cent. For the special rooms which include laboratories, shops, science rooms, art rooms, and all others equipped for a special use, the room use was 71 per cent, and the pupil-station use, 55 per cent.

On the basis of these studies and experience of many secondary school principals, there is a rather general acceptance of an 85 per cent room use for the academic rooms and 70 per cent for special rooms in the larger high schools. Smaller high schools find difficulty in achieving these standards because of low enrollment, required courses, and the like. In the outset the writers were of the opinion that the same standards of room use as noted here for secondary schools ought to be realized in a college or university. However, we have concluded that such is not feasible for these reasons:

1. Most secondary schools are all under one roof while in a large university there are many buildings often widely separated.
2. In a secondary school there is more uniformity in room design and less spread in the educational program.
3. In a secondary school the responsibility for scheduling is lodged with the principal who does it for a faculty directly responsible to him. Even though in a college and university responsibility for scheduling rooms may be centralized in one office, there are college and departmental officials concerned who are not directly responsible to the scheduling authority.
4. The control of class size, which is a very important element in both room and capacity utilization is better exercised in secondary schools.

If the present standards for secondary schools are too high, what then constitutes a reasonable standard for room use in a college or university? In the autumn quarter of 1947, the average room use of the lecture rooms in twenty-four of the major university buildings was 75.97 per cent on the basis of a forty-five hour week, with a range of from 40 to 92.4 per cent. Incidentally, that percentage is almost exactly twice the percentage of those same buildings in the fall of 1937 when the enrollment was 12,826, or almost exactly one-half of what it was in the fall quarter of 1947. From our experience, we have concluded that it is neither practical or feasible to appreciably increase that percentage, namely, 75.97 for lecture rooms. For laboratories and other highly specialized rooms, it is doubtful whether a room use in excess of 60 per cent is reasonably attainable. In the matter of student capacity, there is so much variation in class size among the various departments in a large university, that again it is not feasible to attain the usage found in the fifty Ohio high schools mentioned above and in other similar studies.

Problem Alleviated but Not Solved

Earlier in this discussion the statement was made that in the judgment of the writers, the Ohio State University had done an excellent job in housing this large enrollment. However, that should not be construed to mean that so long as the enrollment did not appreciably exceed the present 25,000, the present plant is adequate, for such is not the case. In certain areas and for certain purposes the University is greatly overcrowded. In the matter of offices, for example, 57 per cent of the professors, 67 per cent of the associate professors and 83 per cent of the assistant professors share their offices with one or more other persons. Also, in the main library and the fifteen branch libraries there is a woeful lack of seating space as well as space for new books, periodicals, and the like. On the basis of the enrollment in the autumn of 1947 there was seating space in all libraries for 7.7 per cent of the total enrollment. Other examples might be given of urgent space needs, but these illustrate the situation.

To remedy in part these shortcomings, the Ohio Legislature, at its 1947 session, appropriated $18,641,000 for building and equipment improvements. Already contracts for a new music building and a central service building have been let at 94.5 and 51.25 cents per cubic foot respectively. These were let in November and December, 1947. Also included in the appropriation is $2,500,000 for an addition to the Main Library. It is hoped that the other major contracts can be let within the next year or so. Even when this money is all expended there will still be many urgent building needs both in terms of replacement of present structures and new facilities.

Since the whole question of the utilization of college and university buildings will continue to demand a large amount of attention, the writers would be interested to receive the results of utilization studies in other institutions. With such data from a number of institutions, it is believed that there might be developed satisfactory standards for both room and capacity utilization which can be attained without serious hindrance to either staff or students.

TO BUILD OR NOT TO BUILD

By EUGENE S. LAWLER

Professor of Education, Northwestern University

Dr. Lawler was born and educated in the Southwest. He taught for several years in Texas, and in 1928 secured a doctorate at Columbia University. As assistant to Dr. Paul R. Mort from 1929 until 1933, he made thirteen state school finance surveys. During this time he was also chief of staff of the National Survey of School Finance, sponsored by the U. S. Office of Education. He has been with Northwestern since 1934 and is doing school surveys for New Mexico and Indiana at present.

THE problem of whether to build or not to build is a live issue. When the governing board of a school system or college or university finds that new construction now costs twice as much as in 1939, only eight years ago, it is likely to hesitate before authorizing the erection of any new building. Yet this same governing board may see an imperative need for additional space for the program in its charge.

The Indices of Construction Cost indicate the September, 1947, cost to be about 175 per cent of 1939 costs. The Department of Commerce composite construction cost index, which takes the cost of 1939 to be 100, gives construction cost in September, 1947, to be 200.2.[1] The E. H. Boech and Associates index for apartments, hotels, and office buildings, for September, 1947, with the cost of 1939, as 100, is 178.4. The lower index for these buildings is largely due to the fact that they use less lumber proportionately than do buildings in general. The school building index for October, 1947, is 177.2 (1939 = 100), probably an all-time high, as stated in *The School Executive* for December, 1947.

Building costs are higher than would be expected from the indices. Even though the indices would indicate that building costs should now be about .75 to 1.80 times as much as in 1939, many bids for school buildings are made for two times as much as in 1939, and buildings which would have been built for from 40 to 55 cents per cubic foot, according to plan and location, are now costing from $.80 to $1.25 or more per cubic foot. This additional increase has been due to the leeway contractors have taken to insure themselves against further rises in price of materials, delays in delivery of material, and other such additional costs that they have encountered in recent years.

Need for More Facilities

The causes of the present need for new building are the G. I. Bill, the increase in the birth rate and the small amount of building in recent years. High construction costs have arrived just when additional educational facilities are needed: in higher institutions because of the G. I. Bill, and in elementary and secondary schools because of the immediate prospect of high enrollments from the increased birth rate which began about 1940. This need is the greater because of the relatively small amount of school and college construction which was completed during the years of the depression and of the war.

Conditions vary in different localities, but the effect of the higher birth rate on the *average* elementary school may be obtained from national figures. According to U. S. Census figures, the total number of births in the U. S. for the years 1940 to 1947, inclusive, was 23,137,000, as against 17,483,000 births in the years 1932-39, inclusive. Since the number of births in the period 1940-47 was 21 per cent greater than the number of births for the period 1932-39, the average school district may expect its enrollment in grades 1-8 to be 21 per cent greater in the year 1953-54 than it was in the year 1945-46. This means in turn, as time goes on, a 21 per cent increase in grades 9-12, and in college, even on the assumption that only the same proportion of youth attend high school and college as heretofore.

Colleges and universities have already felt a tremendous need for increased facilities during the past two years. The indications are that in the years to come a larger proportion of the youth of the nation will attend college and it is even probable that this

[1] Department of Commerce, Bureau of Foreign and Domestic Commerce, *Construction and Construction Materials, Industry Report,* November, 1947, p. 19.

increased demand for college education will offset the decrease in the number of students attending college under the G. I. Bill of Rights. Then, too, after the year 1958 the increased number of youth in the country resulting from the high birth rate beginning in 1940 and 1941 will call for greater capacity in institutions of higher education.

When to Build

It is the obligation, as well as to the interest of every governing board to do as much of its building as possible in periods of normal or less than normal economic activity. Since any school system or higher institution which needs additional space now will need even more in the near future, the construction of needed facilities would ordinarily be initiated promptly. This is particularly true since necessary facilities should be provided more or less regardless of cost. There is no stand-still formula to make it possible for children and youth to wait until it is convenient to provide the necessary facilities for them. To build *now* will require no more labor and materials than to build three to five or more years in the future, and will be no greater drain on the productive capacities of the country now than then.

However, while it may not require any more labor and material to construct a building now than five years hence, it is probable that there will be times in the future, as in the past, when the demand for labor and materials will be less than the supply. It is, therefore, the duty of those who direct building processes to start as little construction as possible in times of extreme economic activity and as much as possible in times of depression.

Federal aid for school construction should encourage long-term planning. When and if federal aid is provided for school construction its method of allocation should be such as to encourage long-term planning on the part of school boards, the collection of taxes for building programs during times of prosperity and inflation, and the actual construction of school buildings when employment and economic activity are below average. But even without any stimulus in the way of increased aid from the federal government, the board of trustees of any higher institution or any board of education has every incentive to build in slack times. The difficult thing is to decide whether there is to be any slack time soon enough in which to build, for educational facilities provided too late are not a bargain at any price.

History Reveals Price Pattern

The history of prices in the U. S. indicates a recession in prices is due. At the present time the burning question in school construction is whether lower prices are in prospect, and if so, how soon. In considering this question a chart provided by Dun and Bradstreet in their circular "The Effect of Three Wars on United States Prices" is of interest. It carries the present U. S. Index of wholesale prices back to colonial days and shows that during the period of each of the greater wars which the U. S. has fought the price index rose sharply to a level usually twice as high as the one immediately preceding the war, and then declined to its previous level.

The "Index of Wholesale Prices" takes the level of prices of 1926 as 100. In round numbers the story that it tells is as follows: During the Revolutionary War period the index rose from 60 in 1775 to nearly 180 in 1779, and declined to about 70 by 1785. In the period of the War of 1812 the index rose from around 100 in 1809 to near 160 in 1814 and fell to about 105 in 1817 and less than 80 by 1820. The Mexican War had no visible effect. In the period of the Civil War the index rose from 61 in 1861 to 132 in 1865, after which there was a long decline, first to 83 in 1871 and then to 59 in 1879. After 1879 prices rose and then declined to about 47 in 1897, after which they rose gradually till the year 1915 when the index was 70, the Spanish American War having had little effect on the index. During the years of World War I the index rose steeply until in the year 1920 the level of prices was 154. Then in just about a year the index dropped almost straight down to 98, in the vicinity of which it remained until 1929. After 1929 came the depression, and the index fell until it got down to 65 in the year 1932. After 1932 the index rose and fell and arrived at 77 in 1939. During the years of World War II the index rose rather rapidly at first, flattened out during the years of U. S. participation in the war, and then rose almost vertically after the close of the war until on December 13, 1947, the index stood at 161.4. Since the War of 1812 the price level has been above 100 only during the periods of the Civil War and World Wars I and II.

Some Extenuating Circumstances

The prospective recession of prices may be delayed. The history of the price index certainly raises a strong presumption that a recession in prices is due. However, there are influences which work to retard, or even to prevent, the prospective recession. The destruction of World War II was so vast that the food supply of the world is still insufficient, and will probably not be normal for at least more than a year, perhaps for two or three years. Meanwhile, the prices of grain and other food products will be very high. The amount of money in circulation, including bank deposits, is far above the amount required to enable consumers to buy the total product of the nation. As long as this surplus purchasing power exists, prices will be high. The excess of purchasing power is likely to persist because the process of deflation would be most painful, and any action to curtail purchasing power, such as the retirement of a large block of the governmental debt, is unlikely.

Furthermore, the Federal Government has to retire or refinance 55 billions of indebtedness by 1952, and the tendency will be to do the necessary refinancing at as low a rate of interest as possible. "Managing" the rate of interest to keep it low means, in the last analysis, keeping the supply of money plentiful, which in turn means high prices. Then, too, there is the desire to pay off the national debt in dollars that are not too dear. Since we have in effect a managed currency this will be possible, but it will mean more dollars in circulation and high prices. Another factor tending to maintain high prices is the Marshall Plan. During the twenties prosperity and prices were shoved up by purchases made in this country from loans made to Europe and South America. The Marshall Plan, if carried through for the next five years, will have the same effect. Still another influence is the vast demand

for goods of all sorts, here and abroad, which cannot be satisfied for several years. Among these demands is one for 15,000,000 new homes in this country. Supporting all these demands is the fact that wage rates have been raised.

The movement of the price level is problematical. A plausible conclusion that can be drawn from the argument so far presented is that although the price level may continue to rise for a year or so, a decided lowering of the general price level is probable some time soon; but there are influences more powerful than have ever existed before that will tend to delay such a downward movement. The present inflation may even continue indefinitely, an eventuality to be guarded against by all those who value the future of the nation.

Building May Not Follow General Trend

Some indications are that building materials will cease to rise in value compared to other commodities. It is true that from 1861 to 1941 building materials rose more rapidly than other commodities. In 1861, 1914, and in 1941 the building materials index stood at 35, 53, and 103, respectively, while the index for all commodities stood at 61, 68, and 87. This means that the building materials index was approximately .6, .8, and 1.2 of the general index and that the cost of building materials rose more rapidly than the average cost of all commodities. A similar computation shows that for 1913, 1926, 1939, and October, 1947, the building material index was approximately .8, 1.00, 1.17 and 1.17 times the index for all commodities. This relative increase in the cost of building materials shown in both the above series which apparently ceased after 1941 probably reflected mainly the increasing scarcity of timber, the longer haulage of lumber to market, and increased wage rates.

The differential between the rise in price of lumber and the rise in the prices of other building materials in the present emergency may be seen in the fact that the lumber index rose from 90.1 in August, 1939, to 285.7 in September, 1947. In the same period structural steel rose only from 107.3 to 143.0; cement from 91.3 to 119.0; brick and tile from 90.5 to 145.4; plumbing and heating from 79.3 to 135.9.

It is clear that the chief factor in the rise of the index for all building materials from 89.6 to 183.3 in the same period was the increase in the price of lumber. Since the production of lumber has been increasing for the past two years, and the stock of lumber in the hands of retailers at the end of September, 1947 (3.8 billion board feet), was 1.7 times the stock on hand at the end of September, 1946,[2] a general rise in the price of lumber seems less likely in the long run than a general decrease. This is particularly true because this increase in lumber inventories was made for the most part in a year when it is estimated that 850,000 private dwellings were started, a figure not far from the all-time record of 937,000 in 1925. It would appear that a further rise in the price of lumber will cause considerable substitution of other materials.

Most other building materials, such as structural steel, cement, brick, and tile are derived from materials which are plentiful and cheap and by processes which are being continuously improved in efficiency and can be expanded to supply any foreseeable demand. An official of a large steel company has even suggested that there may be a decrease in the cost of structural steel early in 1948. It would appear that, short of a third round of wage increases, prices of these building materials are more likely to decrease than increase.

Cost of Labor

On the whole, wage rates for building construction have more than kept up with the general trend of prices and wages. According to the November, 1947, "Monthly Labor Review" the average hourly wage of building construction workers in 1940 was \$.958 while as of August 15, 1947, it was \$1.689, or 1.763 times as much as at the first date. The cost of living index for 1940 was 100.2, while for August 15, 1947, it was 160.3, or 1.600 times as much. Thus, the average hourly wage of building construction workers has more than kept up with the increase in the cost of living. Because building construction workers worked an average of 39.7 hours per week in August, 1947, instead of 33.1 hours as in 1940 their average weekly pay rose from \$31.70 to \$66.97. They received 2.112 times as much per week in 1947 as in 1940.

Of all the classes of labor in durable and non-durable manufacturing reported for August, 1947, in the "Monthly Labor Review," the weekly wage of the building worker, \$66.97, is exceeded only by that of the bituminous coal miner, \$71.49, of the newspaper and periodical publishing worker, \$67.86, and of the malt liquor worker, \$68.62. On the other side, it must be noted that from January, 1941, to August, 1947, the average hourly wage of all building construction workers increased by 71.3 per cent, while the average wage of all manufacturing employees increased by 81.2 per cent. However, the 1947 building wage averaged \$1.69 per hour as against \$1.20 for manufacturing.

Factors Governing Cost Rises

It is difficult to say how much higher construction wage rates will go. They have been rising for several years and their sheer momentum may cause them to rise still more in the year 1948. It is true that in certain localities certain building tradesmen now receive from \$2.00 to \$3.00 per hour.

When employment slackens, the building trades may attempt to maintain their hourly wage rates by spreading the work and decreasing the number of hours worked per week, as was done in many cases during the depression. Since they are closely organized, it is possible they will have some success. This will tend to slow any decline in the cost of building.

A decrease in the productivity of labor may be causing some unduly high building costs. Some contractors in certain localities have charged that restrictive practices by some building trade unions have reduced productivity by as much as 30 to 40 per cent. This is a question on which it is difficult to obtain reliable data. The unions which employ such tactics will have a tendency to continue their use in the case of a recession in building activity in order to make jobs, but in such case those contractors whose workmen pay the least heed to restrictive rules will be in

[2] Department of Commerce, Bureau of Foreign and Domestic Commerce. *Construction and Construction Materials. Industry Report,* November, 1947, p. 25.

the best competitive position, and will tend to be able to keep their organizations more steadily employed.

Certain hindrances to efficient building operations are disappearing. Delays in securing permits, in deliveries of materials and difficulties in securing workmen have in recent times increased the length of time required for a construction project from three or four months to a year or more. This has increased the overhead expense of the contractor and has increased his risk, since he has been unable to secure firm prices for materials. The contractor has met this difficulty by putting escalator clauses in his contracts, and by including a generous cushion above anticipated costs in his bid. Bonuses and overtime wages to workmen have also increased his costs and bids. Some improvement has taken place in these conditions. In some areas contractors have ceased overtime work. It is becoming possible to obtain firm prices on materials, and escalator clauses have been disappearing from contracts.

The interest rate on school bonds probably will not change much in the near future. The rate decreased gradually from 1921, when school bond interest rates of around 5.5 per cent were common, till 1944 to 1946, when many school bonds were sold at rates close to 1 per cent. A saving of 4 per cent in the interest rate on twenty year equally spaced serial bonds amounts to approximately 40 per cent of the building cost.

However, the interest rate on school bonds has been rising since 1946, and was given as 2.8 per cent for October of 1947 in the December, 1947, *School Executive*. There are other indications, such as the lowering of the buying price of U. S. Government bonds by the Federal Reserve Bank which indicate that interest rates are due to stay above their recent low levels. A reduction in income tax rates will decrease the attractiveness of municipal and school bonds to large income buyers, and the rates of return on the bonds will have to be increased to sell them. There is the counter argument that a decrease in the income tax will leave the large income receivers with more funds to invest, which would make more of a seller's market for school bonds and tend to reduce interest rates. The effect of lower income tax rates has no doubt already been discounted.

Unless it becomes clear that the present inflationary tendencies are to continue for some time, there appears to be little likelihood of interest rates on school and municipal bonds going much higher, for, as has been mentioned before, the Federal Government will probably manage finances in order to keep the interest on the $50,000,000,000 or so of treasury notes which have to be refinanced in the next few years within reasonable bounds. It is probable that shifts in the interest rate in the next few years, barring drastic changes in economic outlook, will not be great enough to exercise a decisive influence on building construction.

The psychology of the electorate goes far to decide whether construction shall be undertaken or not. It is sad, but true, that when citizens feel prosperous and are willing to vote the funds, conditions are likely to be unfavorable for economical and efficient construction; while when labor is unemployed and materials are cheap and plentiful the same electorate is likely to feel unable to assume any additional obligation.

The best way out of this dilemma seems to be to obtain the authorization of necessary construction projects and to collect as great a part of the taxes and solicit as many gifts as possible during periods of economic activity, and then to wait for a favorable opportunity to do the actual work of construction. In those states where it is legal, taxes for capital outlay should be accumulated in times of prosperity such as the present to finance needed construction when a favorable time arrives. When the ideal solution is not possible the governing board will have to make the best compromise it can.

Recapitulation

1. Prices are now at a near all-time peak.
2. Past experience indicates that there will be a sharp recession in the price level, but there are many influences still tending to support the inflationary trend.
3. Any construction project which can be postponed till later will likely be erected more economically.
4. Any construction project erected at the present time supports the inflationary tendencies. Its postponement till the supply of labor and material overtakes demand will support economic activity when support is needed.
5. Unless labor is reasonably available, firm prices for materials can be obtained by contractors, reasonably sure and prompt deliveries of materials are assured, and a contractor is willing to make a firm contract without escalator clauses at a price per cubic foot as indicated by the school building index, the probability is that an additional premium is being paid for building in an inflationary time.
6. Authorization and funds for construction projects should be secured insofar as possible by governing boards during periods of economic activity, and the construction should be carried out in periods of normal or less normal activity. To do this there should be a long-term building plan.

Suggested Plan of Action

Even though responsible officials accept the foregoing statements as true, they will differ as to their application to a given district. The following statements are made as an illustration of one possible application of the principles to the building program of a school system or higher institution.

1. A long-term building program should be planned.
2. Any building which is essential immediately to the welfare of pupils or students should be authorized and constructed as soon as possible.
3. Any construction which can be dispensed with by continuing for a few years the use of a building which is to be replaced, or by close scheduling and not too great overcrowding of present facilities, should be postponed.
4. The authorization and funds for each part of the long-term building program should be secured at the earliest possible date. The actual construction should be timed to harmonize with economic conditions, as a matter of economy to the school system or institution and as a duty to the general welfare of the nation and all citizens.

PLANT SERVICES OF THE SCHOOL HOUSING SECTION

Division of School Administration U. S. Office of Education

By RAY L. HAMON

Chief, School Housing

and N. E. VILES

Specialist for School Plant Management

Dr. Viles secured B.S., A.M., and Ph.D. degrees from Missouri and has been superintendent of schools in Pierce City, Lamar, and Neosho, Missouri. In 1931 he became director of school building service for the State Department of Education and began work with the U. S. Office of Education as specialist for school plant management in 1945. He is a member of the American Association of School Administrators and the National Council on Schoolhouse Construction.

Dr. Hamon is a native Minnesotan. His family later moved to Florida where he attended the University of Florida, receiving a B.S. degree. He secured an M.A. from George Peabody College and a Ph.D. from Teachers College, Columbia. He then served in Florida schools in various capacities until the beginning of World War II when he accepted a war-service position with the U. S. Office of Education, gradually advancing to the position he now holds.

OUR American schools and colleges are facing the greatest educational plant expansion and improvement program in the history of the nation. The accumulated lag of new construction, increasing enrollment loads, and the necessity for housing expanded curricular offerings and community services all combine to create an overall educational plant need estimated at 11 billion dollars for new construction and plant modernization for public and non-public schools and colleges. This will require approximately one and one-half billion dollars a year for the next seven or eight years, or a continuous annual construction program for educational plant facilities of three or four times the dollar volume spent for such facilities in 1940.

In addition to needed new construction, deferred maintenance and operation neglect over a period of years makes it necessary for educational officials to give increasing attention to plant maintenance problems and to the improvement of plant operating practices.

Changing Concepts

The educational plant program for the ensuing years is important, not only because of the large dollar volume, but also because of the expanding and changing nature of educational programs and community services to be accommodated. The modern concept of educational procedures and pupil activity is a far cry from the formal program for which schools were designed in the last building boom of the 1920's. Recent developments of new building materials and designs have opened some new vistas for the school plant planner.

In planning plants for the changing educational programs, educational administrators and architects must recognize educational and design trends. There is a danger, however, that some planners will wish to ignore the existence of educational plant standards which have been developed through generations of practice and research. Although some plant *standards* of the past are no longer adequate, there is danger that the trend toward "modern" facilities may by-pass some fundamental principles on which earlier specific standards were based. *Principles* of plant planning which were sound a generation ago are still good, although procedures for achieving these principles may change with the development of new materials and designs. It is desirable to develop improved principles and guides to satisfy the functional plant needs of the ever-expanding and changing educational pattern, but proposed changes should be carefully evaluated in the light of their effect on the welfare of pupils and their implications in terms of functional services.

Increasing Emphasis on Housing

The increased attention being devoted to educational housing indicates an appreciation of the need and of the problems involved. Various professional

groups of educators are studying functional housing needs. Most graduate schools of education offer school plant courses. Some states are now providing substantial sums of state money for local school plant construction and improvements. From the limited supply of men trained in school plant planning, more state departments of education are employing specialists for statewide school plant services. Several city and county school systems and colleges are seeking the services of full-time plant specialists. Many state departments of education and universities hold annual school plant conferences and workshops for school administrators and architects, and there is a growing volume of correspondence and requests for data and advice on school housing problems.

The educational plant planning of today will affect the educational programs for at least a generation. It is extremely important, therefore, that this planning be well done. Sound functional planning of educational facilities calls for active leadership at the federal, state, and local levels.

Federal Recognition of the Problem

School plant services have been developed on a limited scale in the United States Office of Education during the past third of a century, but these services must be developed much further and more rapidly if the Office of Education is to meet present-day demands. Fletcher B. Dresslar was appointed in 1911 as Specialist in School Hygiene and Sanitation, and serviced in that capacity on a part-time basis until his death in 1930. Alice Barrows was appointed to the Office of Education staff in 1919 and devoted an increasing amount of time to school plants until 1928 when she became a full-time Specialist in School Buildings, a position she held until her retirement in 1942. Ray L. Hamon was appointed Specialist in School Buildings in 1943, and was made Chief of the School Housing Section which was created in the Division of School Administration in 1945. N. E. Viles was appointed to the Section in 1946 as Specialist for School Plant Management.

Functions of the Section

The School Housing Section was established to perform the following functions: exercise national leadership in the field of educational plant; develop and direct programs to improve school housing throughout the nation; formulate and direct national studies involving the collection and evaluation of data pertinent to practices and trends in school housing problems; promote and stimulate technical research on school building problems in the National Bureau of Standards, in state departments of education, and in public and private institutions and organizations staffed and equipped for such investigation; arrange for leadership of conferences; provide field services; work in cooperation with state and local school systems and trade and professional associations concerned with problems of plant planning, construction, and management; establish and maintain liaison with governmental and non-governmental agencies and organizations interested in the improvement of school housing; serve as consulting specialists to state departments of education, colleges, boards of education, and professional organizations of educators, architects, and others on problems involved in school plant programs, functional planning, and plant management; investigate and evaluate school plant programs; conduct or participate in plant surveys of state, county, and local school systems; address meetings and conventions of professional and lay organizations on problems of school plant planning and management; and prepare for publication manuscripts, reports, and articles reflecting the findings and developments in the educational plant field.

Representative of the types of problems with which the Section is concerned are: studies to determine the need for and type, size and location of educational plant facilities; cooperative planning of facilities for educational programs and community services; development of guides and principles for functional layouts of grounds, buildings, equipment, classrooms, special instruction rooms, and general and administrative facilities; efficient utilization of existing buildings; preservation of plant investments; building and room alterations for adaptation to changing educational programs; plant safety; improvement of lighting, ventilation, plumbing and other facilities for pupil health, comfort, and working efficiency; improvement of schoolroom finishes; and development of custodial standards for improved plant operation.

Survey Assistance Provided

Several states are engaged in studying and restudying their educational plant programs and in setting up needed state and local organization and personnel for conducting intensive local school plant surveys, functional planning of needed facilities, state and local plant regulations and guides, methods of financing capital outlay, and organization and procedures for the improvement of plant operation and maintenance. The School Housing Section has been requested to participate in a number of these statewide studies by state educational agencies, citizens' committees, and private survey agencies. The Section does not have sufficient personnel to accept full responsibility for state educational plant studies, but its staff has served in a consultative capacity on several statewide studies of this type.

Local administrators realize that each new building unit, addition, or major improvement must fit into and become an integral part of a planned plant program. Sensing an extensive program of school plant expansion and improvement, hundreds of school districts desire assistance in making surveys to determine the immediate school plant needs of their respective communities, and in projecting long-range planning programs. The School Housing Section is frequently requested to conduct local school plant surveys involving full responsibility for organizing the study, collecting data, drawing conclusions, and preparing and presenting the report. Staff limitations make it impossible to accept many invitations of this type. If a local school plant survey is to be conducted by the state department of education, or by the local administrative unit in cooperation with the state department, the School Housing Section does often provide consultative services in organizing the study and in checking conclusions and recommendations. The Section will give priority to studies of this type which are conducted by the state department of

education as a survey pattern for the state. These projects involve many conferences with school officials, architects, and local committees. An attempt is made to promote the development of long-range programs, organized in a series of attainable steps and designed for adaptation to changing school and community needs. As individual sites are selected, the local officials are encouraged to develop master plans covering the proposed layouts for buildings, playgrounds, and drives for each site.

Aid in Functional Planning

After the surveys are completed and the overall plant needs have been determined, many local school units need assistance in developing the various steps in the building program and in planning the facilities to be included in each building. Some states do not have the services of a school plant specialist from the state department of education, and in most of the states where such services are available the demand is so heavy that these specialists find it difficult to provide all of the assistance desired. In a limited number of cases the Section provides consultative services in the field to and through state departments of education working on local school plant programs. The members of the School Housing Section also confer with many school officials and architects who come to the Office seeking assistance.

There is an active and growing interest in the necessity for and the procedures to be followed in tailoring a school plant to meet the needs of the program to be offered. Teachers are being given greater opportunities to study the room spaces and facilities needed for the respective fields of teaching. Increasing attention is also being given to the development of special types of facilities for various community activities in the school plant. The limited staff available does not justify the acceptance by the School Housing Section of a continuous consultative relationship to a local school building program. The Section does, however, accept many joint state and local invitations to serve a city or county school system or college for a few days in a general consultative capacity in relation to the overall plant planning and management programs and the functional layouts of selected building projects. It is felt that such conferences with local school administrators, teachers, architects, and lay groups tend to stimulate better functional planning.

Services to Colleges

The veterans' educational program, the recognized need for more technical education, the general desire for more college training, and the rapid development of the junior college have all contributed to the shortage of educational facilities at the college and university level. Emergency war housing facilities have given temporary relief, but institutions of higher learning are still faced with overwhelming problems of plant expansion, remodeling, and improvement. The School Housing Section has participated in a number of plant studies of individual public and nonpublic colleges and universities looking toward the development of long-range programs of plant expansion and improvement.

There is a growing demand for assistance in the master planning of college and university campuses, the functional planning of general and departmental facilities, and the development of student housing. There is a dearth of literature in the college plant field, and most of the plant programs must be individually developed through cooperative planning with but limited consultative services from federal and state sources. The School Housing Section provides some educational plant services to colleges and universities, but the services available from its present limited staff are indeed meager when compared with the pressing demands.

School Plant Management

Recent disasters in schools, hotels, and other public buildings have brought anew to school officials and parents a realization that more attention must be given to school safety. School plant safety cannot be overstressed as long as the life of any pupil is imperiled, or even as long as valuable school records and school property are endangered. The School Housing Section cooperates with school officials and national and local organizations in promoting school plant safety. Attention is given to the development of safe construction standards, to the removal of fire hazards, to reducing building and ground traffic dangers, and to the maintenance of adequate emergency evacuation procedures for pupils. Occasional local inspections are made as time permits.

Some school buildings that cannot be replaced now should be remodeled and modernized so that they may render effective service over a period of years. The School Housing Section attempts to assist state and local officials in the development of criteria for determining when an old building should be remodeled. It outlines areas where modernization is needed and advises on modernization procedures and on desirable standards of safety, utility, and economy to be used as guides in a modernization program.

School plants do not continue to give effective and economical service unless properly maintained, operated, and protected. The lack of adequate custodial service renders a building less effective as a learning center and imperils the bodies and health of the pupils. The School Housing Section gives specific attention to the development of standards for school housekeeping, custodial training, sanitary practices, lighting, heating, and ventilating. This Section also advises school officials on repair programs, and repainting and decoration schedules. Property protection through the elimination of fire and other hazards and the development of adequate economical insurance programs is encouraged.

Current Data and Trends

Within the limits of available staff and time, the School Housing Section attempts to collect current data and, where feasible, predict trends on some of the more important phases of the educational plant problem, such as curricular trends, teaching methods, and community use that affect planning; new types of design; geographic and grade distribution of school enrollment; school district reorganization; new construction materials; cost trends; furniture types; playground surfacing; and lighting equipment. In a limited way, the Section attempts to serve as a clearing

house for information, procedures, and practices in plant planning, financing, and management.

Records and Reports

The Section is cooperating with other sections and divisions of the Office of Education, state and local educational officials, and committees of professional associations in developing improved systems of educational plant records and reports at the local, state, and federal levels.

Conferences

A federal office is rather far removed from the actual planning, designing, and construction of a specific educational plant. Much of the service of the School Housing Section is necessarily second or even third hand. Although a weak substitute for actual consultative services on specific projects, school plant conferences, workshops, and clinics are means of distributing and exchanging ideas, experiences, and practices.

The staff members of the School Housing Section spend considerable time in school plant conferences of from two days to two weeks each. They devote nearly all of the summer months to state and regional conferences and workshops at university centers. The two specialists in this Section can accept only a limited number of summer workshop invitations, and they must be scheduled rather carefully to avoid conflicts and to minimize travel. These conferences are of various types; some are for administrators; many include architects, board members, and college professors; some include teachers; some are for custodial engineers and superintendents of buildings and grounds; and some are for technical specialists.

How the Section Operates

In keeping with the general policy of the Office of Education, the School Housing Section works primarily with and through state departments of education, particularly for all institutions within the jurisdiction of the state department. Routine correspondence from local schools and individuals regarding printed information and references is answered directly. In answering individual and local correspondence from states maintaining state school plant services, reference is made to their own state school plant specialist as a source of information. Correspondence bearing on state policies or involving state relationships is referred to the respective state department; or, if answered by the School Housing Section, copy of correspondence is sent to the state department.

The procedure in requesting information and service from the School Housing Section is very informal. Minor requests for data and advice which can be handled by correspondence should be sent directly to the Section or the individual concerned. Requests for major field services involving considerable time of the specialists should be made to the U. S. Commissioner of Education with copy to the School Housing Section.

It is preferable for local school systems and institutions to secure the concurrence of their respective state educational agencies when requesting school plant services involving visits of federal personnel. Preliminary arrangements may be made directly, but state agency concurrence should be secured prior to final confirmation for field services. This policy recognizes state educational authority and the importance of overall statewide planning for long-range programs.

A great deal of correspondence relative to educational plant facilities is referred to the School Housing Section by other sections and divisions of the Office, by members of the Congress, and by numerous federal and non-federal agencies. In accordance with general Office policy, letters addressed to members of the Congress or to chief state school officers are signed by the Commissioner or the Deputy.

Relationships with Other Agencies

The School Housing Section maintains professional relationships with current and contemplated educational programs through state departments of education, professional associations of school and college administrators and teachers, national and regional associations of educational plant specialists, and other professional groups interested in improving educational facilities.

Following are some of the organizations with which this Section maintains working relationships: American Association of School Administrators, American Council on Education, American Educational Research Association, American Institute of Architects, American Standards Association, Association of School Business Officials, Illuminating Engineering Society, Interstate School Building Service, National Bureau of Standards, National Council of Chief State School Officers, National Council on Schoolhouse Construction, National Fire Protection Association, National Board of Fire Underwriters, National Education Association, National Facilities Conference, National Safety Council, National Society for the Prevention of Blindness, President's Conference on Fire Prevention, Rural Electrification Administration, Southern States Work Conference, and the U. S. Public Health Service.

Service Priority

Since the School Housing Section cannot possibly meet all of the requests for service, it is necessary to make careful representative selections from requests for field service. Requests for service are usually accepted in the following order of priority on the theory of providing the maximum service to the greatest number: statewide projects, under the auspices of or in cooperation with state departments of education, involving studies of public school and college plant needs and development of state regulations and guides for plant planning, construction, and management; national, regional, and state workshops and school plant conferences of educators, architects, and maintenance and operation personnel; consultative services to local school administrative units, under joint invitation of state departments, in regard to studies of plant needs, selection of sites, functional planning of facilities, remodeling projects, maintenance and operation of plant, and custodial training; plant problems of individual colleges and universities; and writing for non-government publications.

Summary of Section's Activities

During 1947 the personnel of the School Housing Section participated in the preparation of yearbooks and/or spoke at the annual conventions of nine national organizations; served as consultants in fifteen state and local educational plant studies and building programs; and participated in the programs of twenty different state educational plant conferences of administrators, teachers, architects, and custodians and maintenance men. In addition to contributions to yearbooks and reports of other agencies, the staff of this Section, during 1947, prepared for publication two pamphlets, three professional reports, and fourteen magazine articles. The School Housing Section has a heavy daily correspondence answering requests for information, advice, and services.

In addition to services in this country, the School Housing Section has considerable correspondence and frequent conferences with educational representatives and school architects from foreign countries. During the past year a member of the Section staff was loaned to the War Department for ten weeks to inspect school facilities in Germany and Austria and to recommend to Military Government plans and procedures for improving and increasing school housing in the American Zones of those countries.

Limitations and Proposed Expansion

Budget limitations have made it impossible to expand the school housing activities rapidly enough to keep pace with the increasing demand for services and assistance. It would require a number of additions to the present staff and sizable increases in funds for travel, conferences, and printing in order to meet the demands on the School Housing Section, and to render effectively the educational plant leadership which should be expected from the Federal Government and which is implied in the Section's functions. It is obvious that this Section cannot carry out the responsibilities implied with its present staff limited to two specialists and two secretaries. The services of the present small staff is further limited by inadequate travel, conference, and printing funds; a situation which prevails throughout the Office of Education.

The Section's program of field service is necessarily limited to projects which can pay the traveling expenses of the staff; thus, field trips must be scheduled to serve only the paying unit rather than an entire area. This makes it difficult to serve a large number of schools which are urgently in need of school plant services. Since most state departments of education do not have funds for traveling expenses of non-state employees, most of the Section's field service with state departments must be connected with local studies or institutional conferences.

Because of budget and staff limitations, the School Housing Section, like other sections of the Office of Education, is forced to neglect needed research and investigations in the school plant field, such as suitable types and efficient designs of furniture and equipment, school population trends and their effect on school plant needs, plant implications of curricular changes, functional layouts of regular and special classrooms, landscaping layouts, school plant costs, and better methods of plant management.

Many of the state departments of education do not have school plant specialists to interpret and to make available to the schools information on costs, trends, planning techniques, and other school plant data developed or assembled at the national level; and the present federal budget limitations do not permit the printing of such information.

Proposed Expansion of Section

The United States Office of Education has anticipated the need for additional national research and advisory and consultative services on school plant problems. In the Office of Education reorganization plan,[1] the United States Commissioner of Education proposed a three-year expansion program of educational plant services to include sixteen professional specialists and sufficient clerical services and travel allowance to render the major services assigned to the School Housing Section. The needs for school and college plant services now justify the Commissioner's proposed expansion of the School Housing Section.

[1] Federal Security Agency, *Annual Report of the U. S. Office of Education*, 1944.

THE EVOLUTION OF THE SCHOOL BUILDING

By N. L. ENGELHARDT

School Plant Planning Consultant

Scruggs and Hammond, Landscape Architects

A Yale graduate, Nickolaus L. Engelhardt followed the career pattern—teacher, principal, superintendent—until the work being done in school administration at Teachers College, Columbia, compelled him to resign his position to attend. There he developed his interest in this field in which he was to become a national authority. After five years as Associate Superintendent of New York City schools, Dr. Engelhardt "retired" to become even more energetically involved in all aspects of school plant planning.

IT'S A far cry from the one-room schoolhouse of early pioneer days to the complex structures of this present decade, with their many classrooms, shops, laboratories, and large group spaces. The small irregular sites of 100 years ago have been supplemented by acres devoted to recreation, agriculture, and out-of-door learning. The one room of that period scarcely suffices to house the paraphernalia of today's school custodian. The changes in school buildings over many decades have come through a process of accretion. As new educational horizons have been perceived, new objectives have been defined, resulting in the need of greater space. In fact, the school building advancement in our nation reflects the zealous interest and abiding confidence our people have in education as a force for national integration and continued prosperity.

The four walls of the one-room school confined educational growth in many areas for but a short period of time. Additions first came in terms or one, two, or three more classrooms. Provisions for children's outdoor garments and lunch containers logically came next. Vestibules for protection of entrances against the weather were found essential and in these, hooks for clothing were attached to the walls and shelves were installed for safeguarding the lunch children brought from home. In New England, placing a second classroom above the first, with access through a wooden stairway winding over the vestibule, was found to be an economical measure. In such cases safety of exit from the second floor was not a matter of prime consideration.

In many early schools fireplaces, later replaced by a stove in each room, provided an unevenly distributed warmth; toilet accommodations varied from the most primitive to enclosed structures in the rear of the lot; and drinking water, pumped from a neighbor's or the school well, was dispensed in the classroom with a common drinking cup from the school pail. In many cases, artificial lighting was, of course, nonexistent and furniture crude although usefully planned for the work of that day.

More Children Meant Larger Schools

As communities began to form and enrollments grew, the nests of two, three, or four classrooms expanded to six and eight and ten. More buildings became large, two-story structures. Stairways were provided at strategic places to serve all rooms. A headmaster or principal was found necessary for these larger buildings. On early plans a small administrative office appears as well as a small supply room.

A spacious attic, under slanting roofs, covered the second story and cavernous basements were excavated to protect indoor play areas as well as to provide fuel storage space. With the advent of centralized heating, this basement space took on new utilization and as plumbing advanced, crude toilet installations were made on the girls' side and the boys' side of the basement.

Rapid progress made in heating and ventilating was reflected in the last decades of the past century in school building design. School boards, who contracted for a heating system were frequently given the complete drawings of a school building by the heating company. Thus the heating of the building became a major consideration in the planning.

It became increasingly necessary to make the space provisions for educational services for which the community was clamoring. Elementary schools were no longer sufficient, high school needs were appearing and could not be met through the academies and private schools. Community gatherings for various purposes must be served and hence the school auditorium came into being. The logical and most economical location was in the huge attic space. Third-story auditoriums were built into old structures and rapidly became a definite fixture in new buildings.

In the seventies, eighties, and nineties, many school buildings were erected throughout the country with brick exterior walls and wooden joist interiors, although at the same time completely wooden structures were not entirely discontinued. The architecture of these brick-walled buildings was largely borrowed from abroad and tended toward the ornate. Bell towers usually rose above the third floor auditorium, glorifying the building above most others in the community. Plan types from the Eastern seaboard were duplicated frequently in the growing communities of the Middle and Far West.

By and large, the nation's experience with wooden joist buildings encased in brick walls has not been a happy one. Disastrous fires destroyed the investment and frequently took the lives of children and teachers. Exterior fire escapes, often of wood and later of metal indicated the lack of confidence of boards of education in the buildings they erected.

Expanded Program Demanded Greater Facilities

Before the turn of the century, new school needs required housing. In the large schools, lunchrooms had become necessary. Basement space, though dismal and forbidding, was set aside for eating lunches brought from home. With the addition of manual training and domestic science to the school's offerings, the basement was again called upon to provide the housing. Even to this day, although the original placement resulted from unenlightened economy, tra-


The unfriendliness of yesteryear's schoolroom . . .

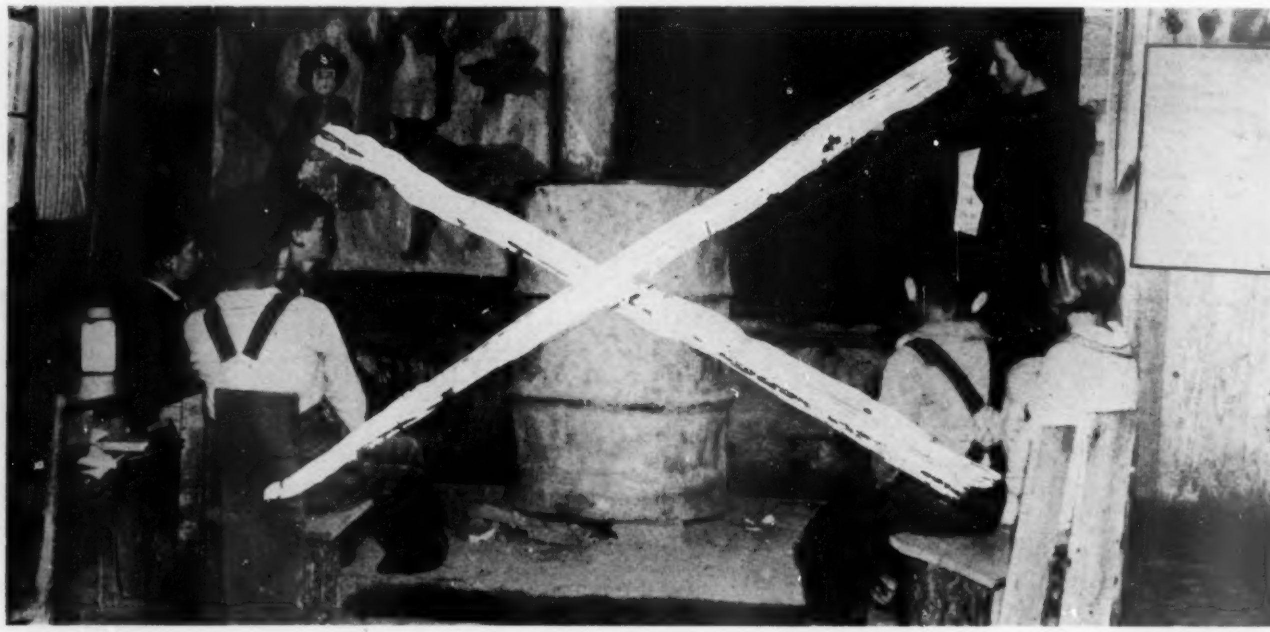

. . . gave way to the cheerful, airy, learning room of today.

dition, overbalancing important educational considerations, dictates a similar unfortunate placement for these important school subjects.

The early schools of four and eight classrooms frequently had no corridors. This was often true of larger schools. Cross traffic was through classrooms in such cases. Stairways were not always planned to permit continuous passage from the top floor to the out-of-doors. Interior stairs terminating in the middle of corridors were planned for traffic ease rather than for safety. The connecting corridors of today's schools are taken for granted, but they were a long time in arriving.

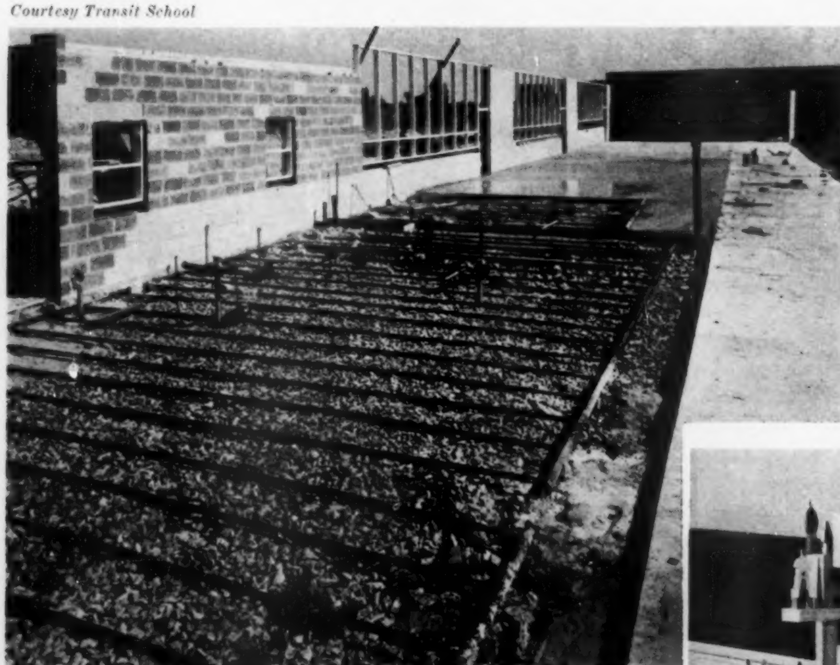
Certain other forces were playing their parts in affecting school planning before 1900. The incorporation into high schools of the science laboratories following the college pattern, the increased emphasis upon library needs in the academic program, the need for better administrative facilities and provisions for the faculty, and the growing pains of the physical education program all had their influence.

In the first decades of this century the changes in



Courtesy Transit School

The teacher had to compete with the trash can for the pupils' attention.



Courtesy Photo Art Studios, Portland, Oregon

No germs or eyesore here—even as the boys play on the floor —thanks to clean, radiant heating!

school building planning took on a rather dramatic aspect. Modern plumbing had come into its own and was affecting school planning in no little degree. New methods of construction were being applied to schools. Emphasis upon safety and sanitation was current in the public mind. The improvement of furniture and equipment was being stressed. The curriculum expansively accepted additions beyond the formal subjects of previous decades. The real need for better and safer auditoriums, larger libraries, basketball gymnasiums, shops and laboratories for the home arts, and well-planned lunchrooms was widely recognized. School buildings became safer structures, housed larger numbers, gave some consideration to occupants' comfort and, in general, met the current needs of a changing educational program. Experiments in methods of ventilation multiplied and the artificial lighting of classrooms was being recognized as essential.

Specific Needs of Children Considered

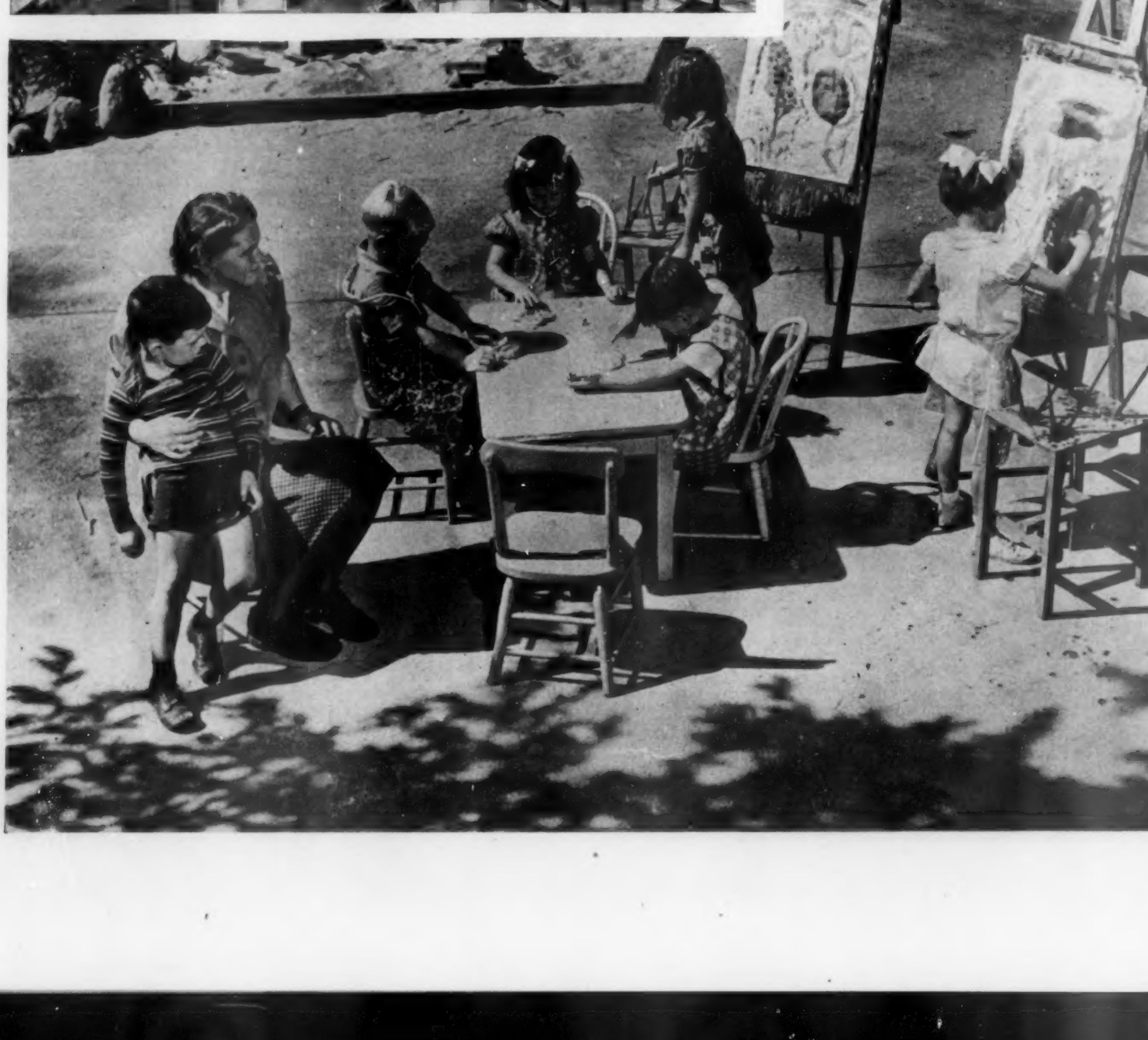
The first well-planned and equipped playground for American schools represented a new outlook in

The children below have no memory of "lunch box days" and dingy halls—when the school did not concern itself with food. Nutrition experts have planned their meals. The boys and girls will be more alert students in the afternoon.

public education. It suggested that boys and girls needed the proper provisions for play, recreation, and the building of healthy bodies. This refreshing attitude toward childhood's needs was long delayed in development. Even today many an American school seriously lacks the area and the facilities for wholesome play. The many cases that do exist, however, of large sites and planning for both sexes and all age groups, represent the people's recognition of the values of play and recreation as part of the school program. The time may not be far distant when every school will be the full beneficiary of the influences which began to operate about fifty years ago and which recognize the educational importance of wholesome, guided play for children.

Over the past three or four decades vast changes have taken place in school planning. The number of educational spaces designed for specific purposes has increased enormously. For example, New York City has three hundred and fifty kinds of shops for voca-

In informal classrooms the children feel free to express themselves. Below, as they model and paint in an outdoor art class, they incidentally pick up a few vitamin D freckles.



A far cry from the sand lot is this fully-equipped gymnasium. Sports have found their place in our schools, clean athletics being as truly an American heritage as the Bill of Rights.

No stairs to climb, no going in and out of doors, students find the jog between classes a pleasant one. This soundproof, fireproof hallway is spacious enough to ease interclass traffic.

tional and industrial arts purposes alone. The administrative provisions have begun to recognize the individualistic, clinical nature of education. Classrooms have, in some measure, been planned for expediting the work of instruction. The educational values accruing to school and community have been given attention in auditorium planning. The laboratory nature of other subject matter areas besides the physical sciences has been recognized. The provisions for music and the other fine arts have been expanded to meet the demands. Libraries have been enlarged and their service needs have been planned for. The gymnasium facilities and ancillary accommodations have grown in accord with better interpretation of the needs to be met. The specialized provisions for industrial and home arts have kept pace with the teaching demands.

In these last three decades large school sites have been purchased in many communities and school plant planning has been fully integrated into the complete city plan. No longer are school sites and school buildings left out of city planning to be considered when all other government branches have been adequately served.

The school buildings of today are most often structures in which the community may take pride. They may represent long-time struggles between community groups for the advancement of educational ideals. They may stand for the everlasting insistence of individuals or groups upon keeping public education in step with other community progress. They illustrate, in some small measure, the advance made by professional administrators and teachers in techniques and methods, as well as objectives in the training and education of American children.

More Changes for the Future

The next decades may be expected to bring even greater gains. The schoolhouse must serve the entire community for all its needs. The emphasis in planning should be upon creating an environment conducive to the wholesome improvement of American living. The creative faculties of our people must be stimulated through the opportunities the school affords. The cultural phases of living together must be enhanced and the induction of youth into superior aspects of citizenship must be made a reality. School administrators and planners must concentrate on making the school serve as an instrumentality toward those ends.

New methods of construction will emerge, new designs will be created, and new inventions will provide greater comfort, safety, and healthful conditions in school buildings. School buildings will be improved, in greatest degree, however, where educational objectives are refined and detailed and where the true functions of education are aided and advanced by the character of the building itself.

There are communities which may still find themselves many years behind in school building progress. It is quite possible that in some of these places the educational progress has outrun that of the buildings. It may also be true that, given a modern educational environment, the school program may advance more adequately to serve youth. Doubtless in many centers, educational effort will bring more satisfactory returns, when the plant facilities and the furniture and equipment—in fact, the entire physical setting—are in accord with the progress man has made in planning for the common good and reflect man's inventive genius in the solution of civilization's problems.

DESIGNING EDUCATIONAL BUILDINGS FOR TOMORROW'S NEEDS

By T. NORMAN MANSELL, Architect

Philadelphia, Pennsylvania

A long-time resident of Philadelphia, Mr. Mansell was graduated from the University of Pennsylvania in 1926. His work with Richard Erskine consisted primarily of school, hospital, and institutional architecture. About ten years ago Mr. Mansell opened his own office. Through work with the Philadelphia City Planning Commission he acquired his interest in community planning. He has organized and advised several recreation associations and at present he is making a study of school lighting.

WE HAVE READ with interest and profit the many recent articles and brochures on the school, its planning, and the functions of those who effect its creation, its use and its operation.

However, even a familiarity with school planning and the problems of cost, construction, and use has not counteracted our impression that the well-rounded school plant has reached a state of maturity, compared with the typical public school of thirty years ago.

It has grown from a block-like building rather casually containing classrooms, to a structure which must blend into and even mold our community life and leisure time, our moral and political philosophy, and our personal characters, in addition to imparting the accumulated knowledge of man to each succeeding generation.

We look with some dismay at the task before the schoolman and the architect in meeting the needs of our civilization. We realize the complexity of the modern school plant, and its cost today if all needs could be supplied. Therefore, with a thousand needs clamoring for attention, the school planner who does not place first things first is apt to create an inefficient, poorly functioning school plant. The result would be misdirected children and ineffectual adults.

Start with an Ideal

An idealistic approach is necessary from the very start of the programming for a proposed school. We should strive for perfection even though we fall short of it eventually because of budget limitations or human imperfections.

Many communities which have not taken the opportunity to find what they really needed in educational facilities have been blindly content with niggardly, ineffectual, half-measure buildings conceived in the marriage of budget limitations and obsolete planning. Such buildings are often fondly adopted by an unenlightened electorate.

Do not the planners owe to the public the opportunity to understand the real possibilities of the school plant's service to the community?

It would be far better to consciously build less than what is needed, with a full realization of what has been omitted, than to plan with a vision no higher than the budget level, in blissful ignorance of the lost opportunities.

A community with a vision, with an understanding of what the school can mean to their children and to the community, will sooner or later achieve its ends. Certainly those who must present to the community the necessity of expenditures for school facilities would be well received.

The architect who conceives his plan organization broadly, thinking of future school plant and teaching developments, will produce a building which is not only more adaptable to changing educational techniques, but which also permits expansion and additions at less cost and damage to the original investment.

Since many communities can only afford facilities for basic and essential teaching, it becomes important therefore that the planner re-study the basic principles which motivate our educators. He should review just what in our schools is most effective in training our youth to have the knowledge, the judgment, and the strength of character to uphold our way of life within a framework of fine religious principles, and to protect the rights of the individual. This is a big order, we know, but this is a time for re-evaluation. Material and technical developments move so fast that

otherwise we can go a long way down the wrong road in company with the wrong philosophy.

It may be questioned whether these things are within the province of the architect. We think they are. The architect who does not approach the planning of the community school with an inspired idealism, with a resolve to do something beyond himself, will fall sorely short of his obligations and have his vision obscured by the myriad of material and technical details of his profession.

This is not meant to suggest that the architect build the school as a monument to himself, or that tradition be discarded just for the sake of being different. However, a questioning and open mind is necessary in planning schools for tomorrow.

Place of the Architect

The school architect should have a large part in shaping the school of the future. To do this well and as an individual, he must be a sort of superman if he is to coordinate, control and often stimulate the forces at work affecting the coming school.

He must be at once a creative artist and an engineer, an executive and a diplomat, an analyst and a coordinator, and have a god-like capacity to see the principal issues devoid of all details, while not forgetting the appointed place and use of every one of a million detailed parts.

All of these qualities are seldom found in one individual. Therefore, it is expected that needed qualities will be shared by members of the architect's organization and not all found in the architect himself.

It seems most important that a high inspirational and enthusiastic creative ability, an ability to see cardinal issues early, and an ability to diplomatically coordinate opinions and listed requirements be combined in the architect.

One problem faced by the architect in planning the future school, therefore, is found within himself and his own organization.

Either he must analyze himself and his organization and supplement their deficiencies, or professional competition and the judgment of school boards and those responsible for selecting an architect will weed him out eventually.

Selecting the Architect

A problem will be faced both by school boards and architects in the near future as the nation's tremendous school building program continues on its way.

Architects will be found who have designed schools, and upon whom many boards will rely for this reason alone. Other architects, often younger men, who are able and willing to be of service, and whose abilities will be needed in the large program ahead, will be viewed with doubt by school boards because of their lack of actual school planning experience.

Contrary to the usual opinion of school boards, it is not necessary that an architect should have designed a school building previously in order to obtain a superlative result now. If he has the qualities necessary within his organization, the only thing which differentiates him from a similarly qualified architect who has done school buildings is his willingness to do the necessary study and research.

The same principles of design, research, engineering, and public relations are applicable to every type of building.

Often the architect approaches a new problem with a clearer view, uninhibited by past custom, than the one who has faced the same problem often before, seemingly knows all the answers, but has difficulty discarding obsolete custom for new criteria.

Many architects of high talent and ability who consistently produce excellent work are lost to the school system whose board will not even consider an architect who has done no schools under his own name.

This is often due to the fact that school boards will not take the trouble and responsibility for determining, or do not know how to evaluate the ability of the architects asking for their consideration.

It is not enough just to talk with architects personally. Asking for a written description of their qualifications, including professional experience, their organization, their office personnel, their engineering associates, and other pertinent data could be a first request.

A visit to structures they have designed and supervised seems necessary to us. These need not be school buildings only. Other types of buildings will tell as much and perhaps more about the architect's abilities.

Such a junket will tell much, but not all about the architect. It should be realized that the building result must be measured against the funds the architect had to spend, or else the real value of the structure is not apparent. In addition, the owner is, with the architect, a designer of the building, whether knowingly or not, and often exerts controls and lays impediments before the architect which seriously affect the building.

Therefore, when visiting a building it is well for a School Board Committee to know in advance the cost of that building per cubic foot and whether that was low, average, or high for the period in which it was built. This may reflect upon the ability of the architect to plan and select materials wisely with regard to use and maintenance. Any experienced school board knows that the first cost is not the last, nor often the most important. The capable and sincere architect will welcome the informed investigating of such a School Board Committee. As a matter of fact, such procedures will attract the higher types from the profession to school work if they are assured that a selection will be made honestly on a basis of ability rather than upon political influence, personal friendship, or other pressure.

Programming through Coordination

Coordinating the program and the efforts and thoughts of people which shape the school building grows increasingly difficult for the architect and the school board.

No longer can the architect and the school board alone make all the decisions if the resultant building is to reflect the community's development and form leadership by being ready for its future growth in size and culture.

The needs of various community organizations requiring use of gymnasium, library, stage, play facilities, classrooms, and shops out of school hours, plus the theory of the lighted schoolhouse, pose a problem

in personal relationships and coordination, which the architect should not be required to face alone.

A community council as an advisory group to the school board can assist by channeling community needs and thinking to the school board and the architect in an organized form.

It is becoming more apparent that coordination of the building program cannot be haphazard, not only from the standpoint of particular school system needs, but also from the viewpoint of the community which is increasingly looking toward the school plant as a source of recreation and community activity.

A Continuing Study

Keeping abreast of the developments affecting school buildings, of teaching techniques and theories, of modern classroom lighting, and equipment possibilities, as well as being conversant with new technological and building material developments, presents a continuing research problem to the architect who plans a contemporary building.

His research may follow two channels: one into the functions which the school and its appurtenances should house and perform, and the other into the material and mechanical field.

In the material and mechanical field, we see an advantage in a community's setting aside an existing classroom, or in having some school service organization erect test rooms where unilateral and bilateral lighting, glass block and sun shields, artificial and rheostat controlled lighting techniques, seating arrangements, sloped ceilings, radiant heating and other systems, interchangeable window and wall panels, movable partitions and portable cabinets, and other equipment could be tried out and tested scientifically.

Such data could be worth a fortune to many communities planning school system expansions, and would contribute immeasurably to the development of finer classroom details and the weeding-out of features not pertinent.

The architect must know not only the features of a building material, but also how it may be applied for use. He must be knowingly conversant, for instance, not only about the latest developments in classroom lighting and heating but also the proved tests and analyses showing their worth.

In short, the architect must gain for his client all of the advantages of modern scientific and technological development, dovetailed to support the teaching program, and must in no instance allow the client to become a guinea pig.

A research into the principles and problems which motivate educators cannot help but produce an architect sympathetic to their efforts, nor can an analysis of the place of the school in modern life do aught else to a sincere investigator but fill him with a sense of responsibility and a desire to do better than his usual best.

The architect's research into the school's function will reveal many features of our times reflecting the significant need for successful schools of the future. It may show among other things that the school is taking a new place in the American community; enlarging leisure time can with education make for human happiness and advancements; the complexities of modern life have thrown much of the child's character training formerly accomplished in the home upon the public school system; the demand for adult education and recreation forecasts the era of the lighted schoolhouse; technological advancement requires a longer training period and a great expansion of school plant facilities; modern communications have suddenly made all peoples neighbors and the future of our civilization may depend on a wider social vision and a greater breadth of understanding than can be made apparent in the usual course of social studies.

If the significance of these trends is understood we will have the necessary, enthusiastic, and idealistic people among the planners of our future schools.

The challenges are tremendous and those who must provide the answers must give careful research and thoughtful analysis to measure up to the great need. This business of research requires an ever-questioning mind in the architect. He must in his office organization maintain research as a continuous process, pinpointing particular efforts from time to time upon the particular needs of a client. In such a process every client gains from the benefits to every other client.

The architect for the school will accept no established custom without question and investigation.

Research has revealed that some of the most sanctified practices of school design have resulted in deformations in child growth, and impairment of health. For instance, seating rows parallel with unilateral light sources has been shown to be injurious to eyes and to posture.

Adaptability of Vital Importance

While the details of the present are clear to our vision, the trends into the future are indistinct. Therefore our school buildings must be as flexible as science, ingenuity, and research will permit. If this is done our buildings may be adapted to the future needs without loss in efficiency and at comparatively low cost.

Probably the most important single phase of the architect's planning program might be simplified into the word flexibility.

Most school buildings below college class, in existence over thirty years, are obsolete when strictly measured against today's teaching needs, and few of them are structurally suited or economically adaptable to modern needs through lack of flexibility.

Although the exact useful age of such structures is debatable, the terrific impact on the electorate of replacement costs is not, since *few long established communities have been able to keep their school buildings abreast of teaching needs.*

Therefore, we have diluted our best teaching efforts and sacrificed our children's welfare, simply because school buildings become obsolete too rapidly, and have not been adaptable.

If we could double the school building's useful time before obsolescence we might make the greatest single contribution toward education in the last fifty years. Not only would teaching be more effective, and the school a more adaptable tool in the hands of the educator, but financial savings to a community would provide additional needed facilities in new buildings.

The increasing cost and often unobtainable needs of modern education, and the expanding floor area

needed per pupil make it imperative that costs be reduced or else the proved needs cannot be satisfied.

We suggest that retarded obsolescence may furnish the answer financially.

Each decade develops its planners who are prone to ask why past school planners could not have foreseen the needs of today's education—and then they in turn proceed to plan buildings for their day with little provision for the future. This would be less apt to occur if flexibility were a cardinal feature at the start of programming.

Planners must look far ahead, must sense trends within the framework of our American civilization, and must provide a flexible building within which changing uses and techniques may be accommodated economically.

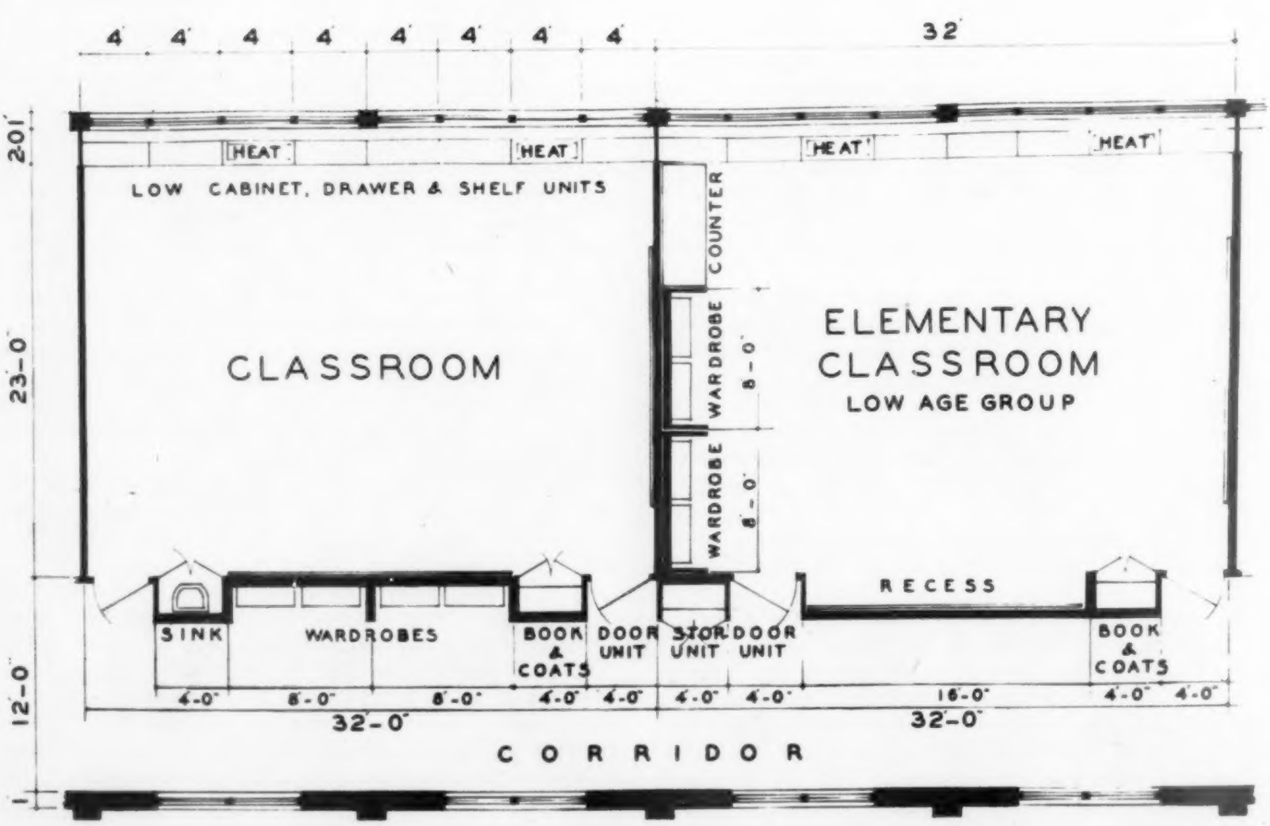
The finest architecture of the past was that which most successfully fulfilled the needs of its time in use, economy, and beauty. We have the temerity to suggest that we must do more, *we must similarly solve the school problems for our time and provide structures adjustable to the needs of a later time.* In reality, however, all of this is a need of our time.

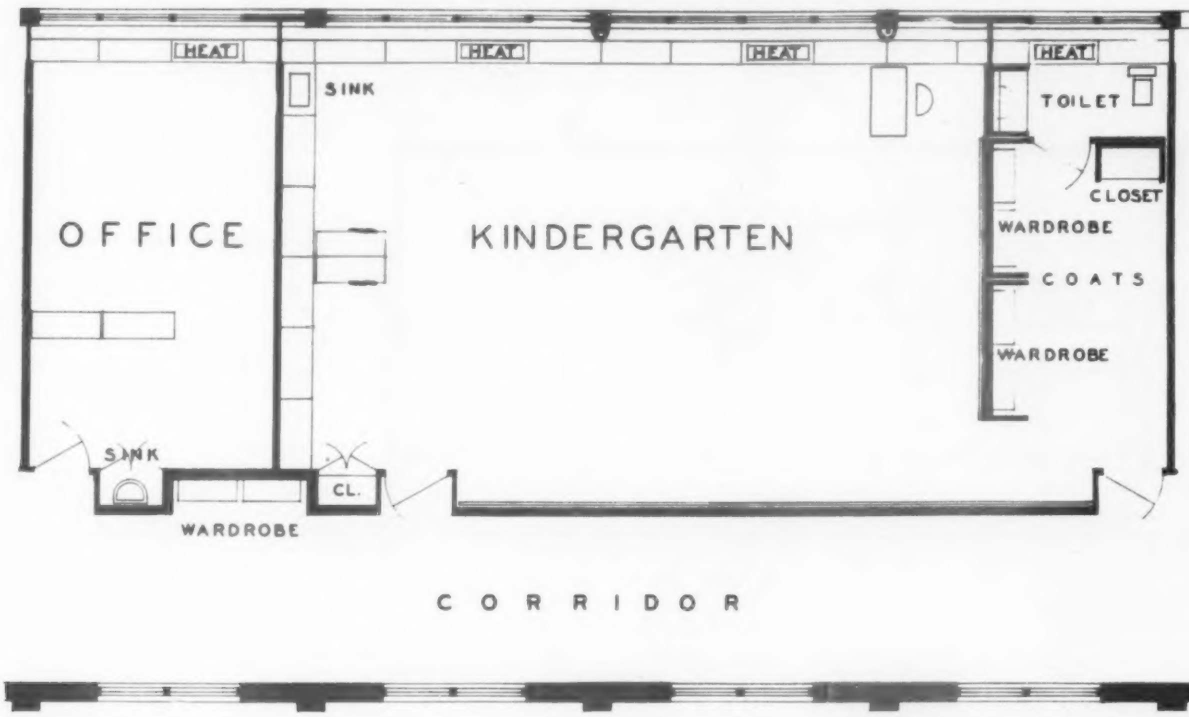
The community whose school plans are so resolved will be lengthening the effective life of its school plants and providing a more highly developed school system for all ages because of the financial savings.

Therefore, if most school buildings planned for teaching techniques and community needs of thirty years ago are obsolete, it behooves us to negate that trend in the future.

We maintain that if wall and window areas can be

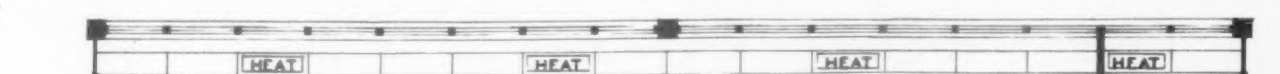
The plans illustrated here show the same section of a school classroom wing in three adaptations and demonstrate the flexibility which is possible in the modern school through the use of interchangeable exterior window and lightweight wall units; movable sectional dry construction separating partitions; interchangeable prefabricated cabinet units based on multiples of four feet, which consist of wardrobe, sink, storage and door and frame units. The plan below shows a typical pair of classrooms separated from the corridor by the cabinet units and arranged so that wardrobes or storage units may face either the corridor or the classroom. The backs of such units would be soundproofed. The drawer and cabinet units along the windows are interchangeable between the heat units, and enclose a pipe chase for heat, water, or drainage connections.

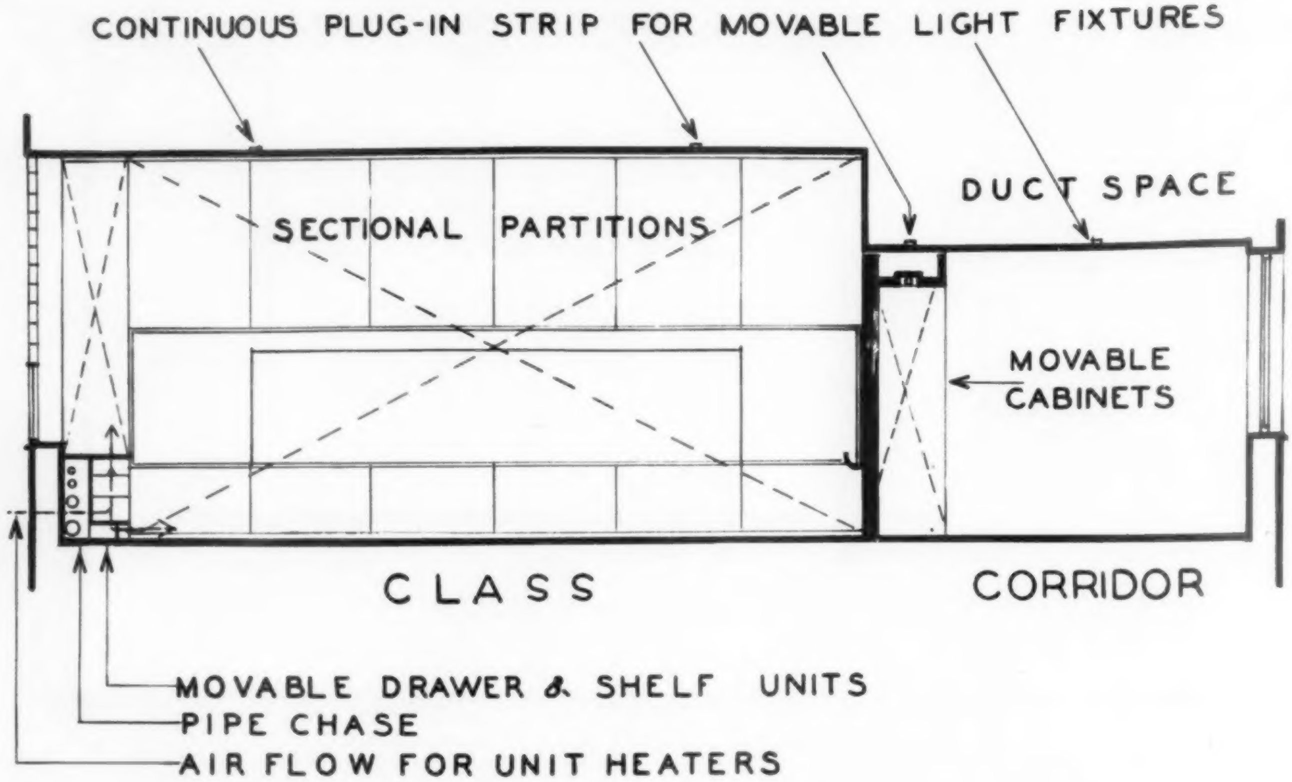




The drawing above indicates the type of change possible from the preceding plan to a kindergarten layout. It provides for toilets and separate wardrobe rooms off a large room and a small office. The multiple heat sources supply the varying room sizes, and the units along the classroom on the side of the corridor as well as inside the room may be adjusted on the four foot module dimension for almost any need. The exterior window units have been replaced with lightweight wall panels to accommodate the adjacent partitions.

The lower drawing shows the possibility of opening up an entire wing for a shop area, provided the structural system has been designed for it. In such a plan, wall and cabinet units which are removed might be placed in school storage areas for reuse elsewhere. While original costs would be higher than the usual type of construction, the increased salvage value in material and the lengthening of the useful life of the school building would seem to indicate great economies for any school system adopting this type of planning.





The knock-down sectional insulated partitions separating the classrooms are movable and may be quickly placed at any point along the length of the classroom wing. These are easily accommodated if the classroom wing is clear of any obstructions, as this section illustrates. Even the light sources controlled at intervals with switches located in movable partitions containing permanent wire for connection at the ceiling are provided by recessed continuous plug-in strips to which light fixtures may be connected and hung at small intervals to accommodate changing room sizes. Blackboards are removable and can be re-erected at any point. The corridor is furred down to allow for duct space and to receive the movable cabinet units, which in turn may have their overhead lights wired from a recessed light trough.

varied and if floor structural systems and lighting systems are properly planned, obsolescence will be postponed for a considerable time.

If this sounds impossible, consider the following:

When schools are planned with fixed partitioning, when glazed areas are fixedly related to standard room sizes, when floor systems take only light loadings, inflexibility and rigidity of use must result.

For instance, three average rooms cannot be thrown into one well-lit shop, because wide exterior wall piers receiving the old partitions stop light, floor loads will not support shop machinery, heat and light sources are inflexible, and corridor partitions cannot be removed for greater room width. Conversely, large rooms cannot be reduced to small rooms as then the dividing partitions will run against windows, and entrance classroom doors are in inflexible relationship to corridors.

Counteracting Obsolescence

Several cities have had to discard old school buildings when changing techniques and population shifts resulted in needs for vocational schools or other uses which could not be accommodated in obsolete and inflexible structures.

Had trends been studied in those cities, had floor construction systems been substantial enough to make the structures useful as factories, a use which school column spacing and lighting permits, some losses would have been avoided.

Wherever shops may eventually be placed, floor loadings can be provided for at slight additional cost.

All the usual defects of inflexibility can and should be overcome.

We are convinced that interchangeable windows and light-weight wall panels are possible now, so that any length of classroom within a wing may be obtained in multiples of about four feet to meet changing needs. Such panels could be removed or placed by two men with simple equipment from within the room. No exterior scaffolding would be necessary.

Multiple flexible heat and light sources can provide the mechanical arrangements permitting varied room and partition placement.

It is possible, using a 4′-0″ measurement module, to make partitions between classrooms and corridors of movable and interchangeable prefabricated units, consisting of 4′-0″ entrance door and frame, 4′-0″ and 8′-0″ soundproofed wardrobe units to face either way, book shelf, sink cabinet, or closet units.

Partitions between classrooms could be soundproofed, demountable, and plasterless, permitting shifting over night with little labor and using ordinary tools.

A light fixture may be shifted along a ceiling in a matter of minutes to any point which changed use in-

dicates is desirable, using materials and electrical systems now available.

The use of prismatic glass and light shields can light all desks more adequately with natural light than has been possible in the past.

Automatic light cells and rheostats can control artificial light in batteries of rooms having the same orientation, so as to supplement natural light on cloudy days and keep desk level illumination constant.

Whole wings may be cleared of partitions and equipment (usable again elsewhere), to accommodate minor class and detail changes, or the relocation of whole departments.

Specific rooms, assembly spaces, or wings should be separately heated and perhaps have their own toilet facilities—all lockable from the rest of the school plant, for community use outside of normal school hours.

All facilities of a school can be planned for extension whether auditorium, lunchroom, shop, office, playfield, or classroom departments. Such planning ahead should provide facilities which do not require expansion but which allow it to occur.

Most of these possibilities can be realized at little or no increased cost over a comparable inflexible plan. A comparison makes them obviously preferable even at an increased initial cost, since a substantial saving accrues to the taxpayers over a short period of time in operation.

If these needs change the architectural character and shape of our school buildings, so be it. Let us accept the changes and the character. At least we will not be led into mental blind alleys by mistaking odd shapes, unusual materials, and fadistic architectural character for good planning.

Restrictions of Style

Problems of style will arise to plague the architect who is sincerely trying to solve the needs of tomorrow's schools. No style devised will be applicable to a modern school without distortion of the details which gave it character and charm. It is better to follow no stylistic precedent than to force one into multilated form.

School boards should recognize that solutions to modern school needs and even current governing codes result in glass areas, protection shields, exits, and horizontal lines which no previous style can include. Directions to the architect to produce a Colonial, Gothic, or other stylistic building can only result in a style variation which will reduce the efficiency of both the major plan concept and its details.

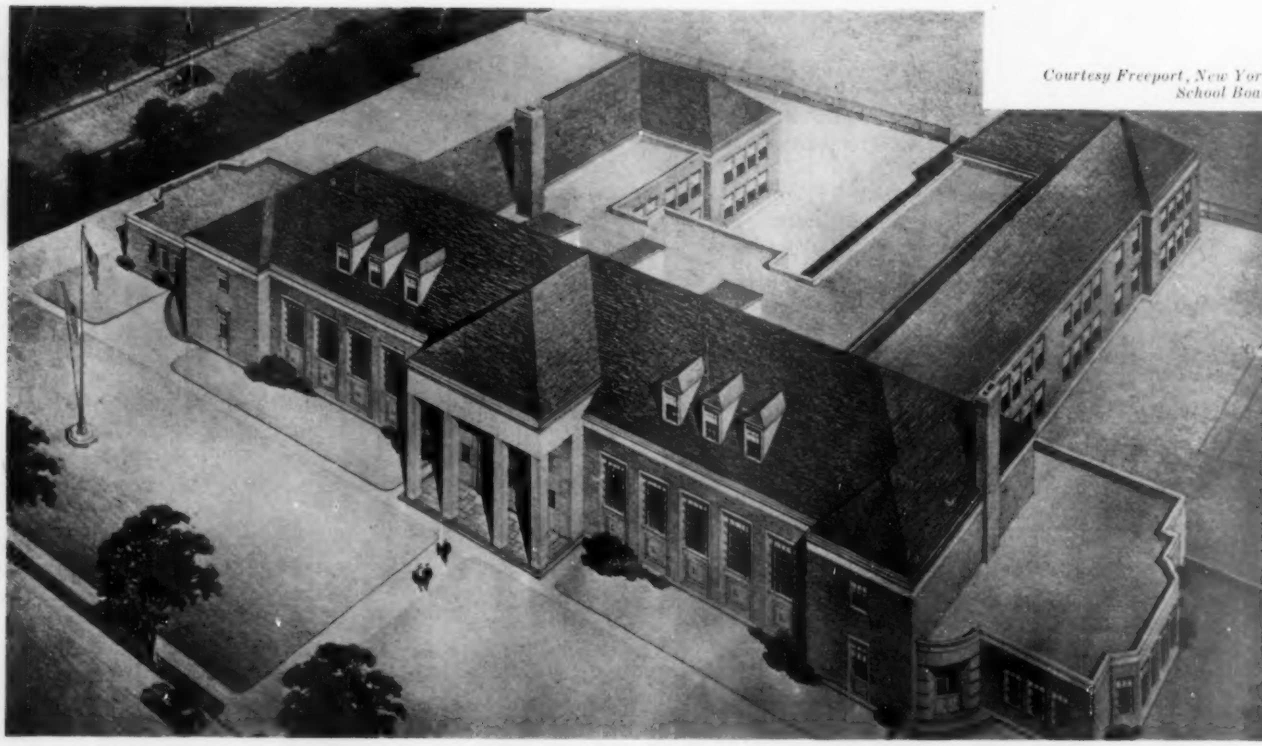
It is better to sacrifice some of the style continuity in an expanding school plant where stylistic structures exist, rather than the efficiency of all new expenditures. A ten per cent reduction in the effectiveness of a building affects not one generation but each one which passes through it.

New buildings can be "in harmony" with nearby old structures, and have the same qualities of beauty and dignity while successfully solving modern school requirements.

The architect and the school board must at the same time be on guard so they are not misled, by superficial "modern" stylistic considerations.

It is easy to have the fancy stirred by the multitude of new and enticing building materials and structural systems, with "interesting" horizontal shapes and one story spread-out compositions, and with glass blocks, pipe columns and clerestory windows. These are all well in their place, but they should be used only where they are the best solution to the problem.

There is no cause for concern or gloom in the complexities of the modern school, in the more important place it is taking in our lives, in the necessity for good planning. It is an opportunity for a fine service and a privilege for the layman and the architect to be called to such a duty. It should be shirked by neither. It affects directly the basis of our democracy.



Courtesy Freeport, New York, School Board

THE MODERN SECONDARY SCHOOL BUILDING

By HAROLD E. MOORE

Superintendent of Schools, Kansas City, Missouri

This year Dr. Harold E. Moore became superintendent of schools at Kansas City, Missouri. Dr. Moore came to Kansas City from Mishawaka, Indiana, where he had been superintendent since 1946. He graduated from Indiana Teachers College and earned his A.M. and Ed.D. degrees from Indiana University. A frequent contributor to educational literature, Dr. Moore is a member of the N.E.A., the A.A.S.A., and the Indiana Town and City Superintendents Association.

DURING the past decade secondary school curricula have changed more profoundly than ever before.

Since the start of the century many beautiful school buildings have been built and millions of dollars have been spent to house the largest secondary school population any nation ever attempted to educate. Usually these beautiful and expensive secondary schools have been improvements in outward design, and perhaps in some respects improvements in certain departments, but rarely have these school buildings kept abreast of or reflected changes in the philosophy of education.

Restatements of Function and Purpose

As a result of recent clarification of the purpose and function of the schools in *Schools for a New World* [1] and through such publications as *Education for All American Youth* [2] and *Planning for American Youth* [3], a new vision of secondary education has been formulated. More recently the establishment of the *Commission on Life Adjustment Education for Youth* [4] and the statement of its apparent functions promises an implementation of curriculum changes and purposes heretofore unknown in the history of secondary education. Since secondary school buildings have not kept abreast of curricular changes during the past decades,

[1] American Association of School Administrators, 25th Yearbook, The Association, Washington, D. C., February, 1947.

[2] National Education Association of the United States, Educational Policies Commission. *Education for All American Youth.* Washington, D. C., The Association, 1944.

[3] National Association of Secondary-School Principals. *Planning for American Youth*, Washington, D. C., The Association, 1944.

[4] Basler, Roosevelt, *Life Adjustment Education for Youth, School Life,* November, 1947, Volume 30, Number 2, pp. 3-6.

modifications to meet the curricular changes that have recently been made are inevitable.

It is not the purpose of this article to deal with the minutiae of planning insofar as each department is concerned nor to deal with the services necessary to make them function, but rather, in as challenging a manner as possible, to relate the philosophy of secondary education to the broad needs and general planning which are basic to a concept of what a school building should be.

Then and Now in American Secondary Schools

In their book on *The Administration of the Modern Secondary School*[5], Edmonson, Roemer, and Bacon suggest a "Then and Now in American Secondary Schools." In it they visualize the changing institution in a series of the following twelve challenging statements:

1. *Then* the controlling objective of the high school was the preparation of pupils for the liberal arts college.
   Now the high school recognizes the necessity of providing for the needs of all youth of a community—the non-college as well as the college preparatory, the slow learners as well as the bright.
2. *Then* high school students were drawn largely from the homes of the more prosperous and more cultured social and economic groups of a community.
   Now all social and economic groups are represented by students in the typical high school, and all classes of homes are represented in graduating classes.
3. *Then* the holding power of the high school was so low that only a small percentage of the entering students remained until graduation.
   Now a large percentage remain in school until graduation.
4. *Then* the program of studies consisted largely of a limited number of units in the older academic fields.
   Now the program of studies consists of units in a variety of academic, vocational, and avocational fields.
5. *Then* the participation of students in athletics, school journalism, school clubs, dramatics, and social life was grudgingly tolerated.
   Now such participation is strongly encouraged for all students.
6. *Then* the discipline was usually characterized by teacher domination, with emphasis on repression of student interests, strict observance of rules, and severe penalties for misconduct.
   Now the discipline is characterized by student-teacher cooperation, with emphasis on school citizenship, good sportsmanship, and the rewards of good conduct.
7. *Then* only a few of the students of low scholastic ability continued in high school beyond the first year.
   Now it is estimated that about one fourth of the students beyond the first year should be classified as slow learners.
8. *Then* the guidance of students was not recognized as a major responsibility of the high school.
   Now the guidance of students is recognized as a task of major importance, and many schools have very complete guidance programs.
9. *Then* the gulf between the eighth grade and the ninth grade was very wide.
   Now the unity of the school system is emphasized through the newer types of school organization and by certain administrative policies.
10. *Then* the typical high school building consisted of one or more study halls, several classrooms of uniform size, and a small laboratory.
    Now the typical building has an auditorium, a gymnasium, a library, a shop, several laboratories, many special rooms, and a variety of classrooms.
11. *Then* the prevailing type of local school organization was the eight-year elementary school and the four-year high school.
    Now a six-year secondary school, with a three-year junior high school, and a three-year senior high school is a favored pattern of local school organization.
12. *Then* the demands on the high school were relatively few and easily satisfied.
    Now the demands on the high school are so varied and extensive, and are multiplying so rapidly, that it is extremely difficult to satisfy them.

[5] Edmonson, J. B., Roemer, Joseph, and Bacon, Francis L. *The Administration of the Modern Secondary School*, Macmillan, 1941, p. 21.

Most secondary school buildings have been built with a "then" date and many are still being planned around such a philosophy. To plan and build buildings for our secondary students with a "now" purpose is the present challenge. Even such concepts as are expressed in the series of statements quoted will be subject to change, criticism, and modification; since, for example, they leave much to be desired when dealing with such fields as the organization of the school to include older youth and adult education.

Relating Philosophy to Planning

To relate this philosophy to building planning requires understanding of the functioning of the secondary school program, of the desirable features and standards of the various areas, and of the local needs in relation to secondary education; some imagination to relate the aforegoing items; and the assistance of architectural and engineering staffs who are able and flexible enough to adapt to the situation and requirements of the local school problem. For the sake of organization, but at the risk of losing sight of the guiding philosophy and the plant problem as a whole, the author is forced to develop the more specific discussion around certain areas. Roughly these areas are eight in number, as follows:

1. The type of organization and the number of students to be accommodated
2. The site for the building
3. The general type and plan for the building
4. The general and community facilities
5. The social and recreational facilities
6. The instructional units
7. Provisions for older youth and adult education
8. The personnel facilities

The author contends that, if the functioning of these areas of influence are thoughtfully and carefully considered by those whose concepts have arisen from such sources as have been suggested, progress will be made in developing a modern school building.

In the discussion that follows, no attempt has been made to set up these areas in the exact order in which they would develop in a practical planning situation. This approach is in harmony with the statement of purpose, which aims to relate the philosophy of secondary education with the problem of the broad needs of the secondary school and general planning. So much overlapping occurs in planning that it would be difficult and perhaps debatable to plan the areas in order, even if the author attempted to set up the procedure in one, two, three fashion.

Organization and Accommodation

Basic to the problem of planning is the determination of the type of organization that best suits the local needs. This organization will no doubt partially determine the number to be accommodated, since the upward or downward extension of the organization

might materially affect the size of the school population. Traditionally the high school has been made up of grades 9 to 12. It is common to find grades 7 and 8 included, also, and grades 13 and 14 are being increasingly thought of as a part of the secondary organization.

The extension upward or downward, or both, of the secondary organization may contribute to the solution of one of the most perplexing problems in secondary school planning; namely, the size of the school population. Many of the weaknesses of secondary education spring from the fact that the secondary group is too small for efficient planning from the standpoint of both curriculum and buildings. This implies a strong community-type district as the base for planning.

While widening the spread of grade levels to obtain numbers for an economical organization may complicate the planning problem in terms of range of needs, segregation of age groups, and the like, the presence of a large number will simplify the general planning problem as it relates to the special facilities needed for secondary education and not obtainable for small enrollments.

On many occasions the combinations of populations from several school districts may be necessary to obtain an economical and educationally sound organization.

Conversely, in very large units it may be necessary to break down the secondary population into blocks as, for example, grades 7 to 9 and 10 to 12, or grades 7 to 10 and grades 11 to 14, in order to obtain an educationally sound organization for a particular community.

It is not possible to state dogmatically that a secondary school should never be smaller or larger than a given enrollment, but the factor of size is of great importance and will determine to a very considerable extent the nature of the school being planned. An example of such determination might be best shown by contrasting the shop facilities in a high school of 150, where a single general or rotation shop might be considered adequate, with those of a school of 1,500, which would support several diversified shops of a specialized character.

In summary, it should be emphasized that type of organization and number of students, which go hand in hand, are of paramount importance. Their determination at the outset of planning is basic to the character of the building to be built. Both numbers and organization are related to the soundness of the school district for which the planning is being done and, in reality, neither numbers nor type of organization can be adequately determined until a school district of sufficient size and strength, and characterized by community lines, has been established.

Site for the Building

The location and adequacy of the site are matters requiring far more thought than is commonly given them because they affect all the other aspects of planning to a marked degree.

The literature on the school plant is filled with

Field Day draws a crowd of parental rooters.

Community endeavors provide opportunity for social growth.

The carnival spirit invades the halls after school hours.

Interest in the drama finds expression in play production.

Fathers and sons share enjoyment in playground activities.

suggestions on how to locate school sites. Most of the suggestions found in standard texts and manuals are good except for the fact that they limit, by their own suggestions, the nature of the site to be selected. An example of such a suggestion is that the present or future center of population and transportation facilities should be factors having considerable effect on site selection. Very frequently the application of such factors make the securing of an adequate site impossible, since the center of population may be near the center of the town or in built-up areas in a city where the securing of an acreage is almost impossible. Likewise, the statement that the minimum site for a secondary building should be twenty acres is often very misleading.

Sizes of sites are relative matters in terms of the size of the school and the functions served by the site. As in the planning of an instructional unit, the size of the site should be determined functionally. Frequently sites serve double purposes; as, for example, they are used for school use and for community recreation. Before site sizes or locations are determined, the functions that the site is to perform should be established. These functions will determine whether a thirty acre site or one of fifty or sixty acres will serve best.

Larger secondary populations; greater age ranges; closer relationship to the community for recreation and leisure-time activities, parking facilities, natural area, or camping units; larger areas for the building itself if a one-story or campus type plan is contemplated; availability of site for future expansion of the school rather than provision of buildings ahead of needs; and relationships to city or neighborhood planning are functions that should be examined before even determining the size of the site, let alone its location. After the functions and size are established, the next step is to determine the general location rather than to be curtailed by locating exact centers of population or other like factors.

The location of sites is of necessity linked with general city planning. Frequently school authorities may cooperate with city planners in directing the development of a city by foresighted site selection. More and more this is becoming an obligation of school authorities. At first thought it may seem far-fetched—that this is related to the character of the building—but exercise of the imagination will reveal

how, through the character of the neighborhood, its size and population, the school building will be circumscribed. This approach might seem in conflict with the functional one already suggested, but it will not necessarily be so if large enough sites are selected and if it is recognized that occasionally sites selected prior to general community development are not usable for school purposes afterward.

General Type and Plan for the Building

Perhaps nowhere in the whole cycle of planning does the character of the building become so established as in the determination of the general type and plan.

The general type and plan for the building will have to evolve out of the needs of the local situation if it is to allow for future development and provide flexibility for extension of units and the creation of new ones as needs develop.

It does not follow that every building is entirely a new creation, since principles and relationships of a tried and tested nature will govern many phases of planning. Illustrations are the location of the office and personnel units so that they will provide maximum service and accessibility, or the location of an auditorium that must serve both school and community use so that it will be accessible to transportation, walks, drives, and parking and at the same time be available to the general school use.

Fundamentally, the general type and plan for the building can only be determined after the several areas that follow in this discussion are dealt with and developed. Certainly the greatest mistake would be to determine the type and plan and try to fit into it the community facilities, the recreational units, the instructional laboratories, and other units. It must be recognized in the beginning that a wide range of requirements for instructional and other units will require a general plan that will not handicap the planners of those units. This procedure will further determine whether or not the building will take on the characteristics of a truly modern secondary school.

The selection at the outset of a square or rectangular type building, particularly one of the closed type, or one with several stories, curtails the development of instructional units that characterize the needs of the modern secondary school.

In contrast, the relatively low, one or two story, open type building that permits segregation of pupil groups and types of activities; variation in types of construction to fit instructional needs; and the location of common units, especially community units, so that they do not interfere with the use of the whole building will characterize the requirements of a modern secondary school. No standard plan will be available either in the office of the architect or in any other building that the Board of Education may visit. A local development by educators and architects is required.

General and Community Facilities

The restatements of function and purpose of the secondary school referred to at the outset emphasize the social and community aspects of the modern secondary curriculum. If the building is to be functional, it must serve these purposes. Nowhere does this phase of secondary training come in for more consideration than in the activities that take place in the auditorium, the simple little-theater type room, the cafeteria, the gymnasium, such open-air facilities as the amphitheater, and rooms for special types of adult education, such as prenatal and child care, continuation education, and others.

No longer is the problem one of simply having an auditorium, a shop, or a gymnasium; it is a question of providing facilities that meet the maximum school and community needs. In many cases duplicate facilities of different sizes and character will be necessary. The case may be illustrated by the inadequacy of the average combination auditorium-gymnasium that serves neither function well, or of the single library that does not provide some segregation of school and adult facilities when used for both purposes.

The problem is one of principle and function where these facilities are concerned. It should be determined by a clear philosophy developed in the community as to what the community's wishes and needs are in this area, and the facilities should be planned accordingly. Nowhere in the planning is fundamental philosophy more important. Few people will question the need for instructional units for a gymnasium or an auditorium, but the expansion of these community facilities cannot be justified unless it has clearly been established through determined needs.

It should be made clear that no textbook or article can list the facilities that should be included in the category discussed in this section. The character of the modern school adapted to a particular community will provide the key to these needs. Of course size of school, grade level, and other similar factors have to be taken into consideration, but the social philosophy is, in the final analysis, the principal determining factor.

Social and Recreational Facilities

The facilities referred to in this section might well be discussed under the heading of the previous section. For the sake of emphasis, however, a brief separate statement is being made concerning them.

The war years' contribution to the function of the secondary school has been to stress the school's responsibility for more attention to the social and recreational life of the students.

Where there was a desire to fufill this function, many secondary schools have been handicapped by the limited or wholly inadequate facilities that were available.

Like the community program generally referred to in the previous sections, the needs, when considered from the standpoint of the whole community, should determine the facilities provided. The development of a community plan and philosophy is absolutely necessary, since in some situations such facilities would be considered superfluous.

It is of great importance, too, to determine what governmental agency is to be responsible for the administration of the social and recreational program. In some communities this is wholly a school administration responsibility, in others it is operated jointly with some civil unit, and in others the entire responsibility falls on the civil administration.

An additional factor to study in determining the

social and recreational facilities needed in the schools is the extent of such facilities operated by churches, private enterprise, and voluntary organizations like the YMCA.

Survey technique, not wholly familiar to school administrators, may be used to discover needs in social and recreational areas. The services of persons trained in these fields should be utilized by school authorities where the philosophy of planning takes the development of the modern secondary school into this field.

Again, as in the previous sections, no effort should be made to provide an exhaustive list of the facilities needed for the social and recreational program. Many such facilities will involve duplicate use by instructional units, general and community facilities, and provisions for older youth and adult education. Because of such factors as were mentioned in connection with the combined auditorium-gymnasium, care should be exercised in a duplicate use approach so that the function of both facilities may be adequate.

The writer sincerely believes that there is a pronounced indication that the secondary school of the present and future must be planned adequately for social and recreational purposes. There is further indication that the relatively small school will perhaps be faced with a greater problem along this line than will the metropolitan high school, because of the problem of providing community facilities. It therefore appears that planners of modern secondary schools must give adequate consideration to this issue as they study their problem.

Instructional Units

No section of this discussion needs as much emphasis as does this one. While probably more thinking, planning, and experimenting has gone into the development of classrooms, laboratories, and shops, much work remains before they will be well adapted to the functional and socializing philosophy of education which the writer is attempting to emphasize in connection with building planning.

Of all these units, the most numerous and most extensively used is the so-called classroom. The modern classroom is totally unlike its progenitor. In the first place, it is considerably larger and much more of a workroom or laboratory in design. Work tables, auxiliary spaces, storage, audio-visual materials and equipment, conference facilities, multiple book materials, some degree of comfort, conditioning for color, seeing, sound, and temperature, and other adaptations contrast it with the box-like and rigid lecture or recitation room of a few generations ago.

It would be misleading to indicate that a transformation to this new type of classroom has been made in American secondary schools; such rooms are strictly in the minority and will be for years to come, but those who believe in a modern philosophy of secondary education will see to it that schools move in this direction in their planning of the new and modernizing of the old facilities.

Laboratories and shops are also larger and more related to life situations in modern planning. Arrangements are less formalized and better adapted for the range from individual to small or whole group activity. Open space where real machinery or working models can be assembled have their place. Services such as electricity, gas, air pressure and exhausts, and others are made available. Sound, air, sight, and conditions similar to those in factory or industrial laboratories are more common.

All of these classroom, laboratory, and shop units are developed under the more modern approach with the aid—yes, the major direction—of the teacher and pupils who will use them. Opportunities for the display of individual and class work are provided through display spaces and cases.

These modern units cost more because of the higher standard, as well as higher construction and material costs; consequently, they have to be used more. Frequently full-day and evening use characterize them.

Recommended too in modern schools is the opportunity for students to move and change their accommodations to fit their work. Today the auxiliary space in the business education department provided for such experimentation may be a business reception room; tomorrow, a simple bookkeeping unit such as small businesses would require. In the homemaking department the open or experimental space may today accommodate a dining room unit; tomorrow a child care or home nursing situation. Frequently spaces of this sort can be made to serve numerous uses in the same department, thus saving a high degree of specialization in all of the rooms.

Flexibility in size of classrooms, laboratories, and shops through the use of movable sound-proof partitions also characterize modern planning.

Carefully developed standards of a specific number of square feet per pupil in classrooms and laboratories still have their place for checking, but should not be followed dogmatically. Likewise, length, width, and height ratios found acceptable over the years should be known. But where requirements for sound arrangement require a greater width, as in a library, shop, or laboratory construction, methods should be found to afford them.

Chiefly by example the author has tried in this section to relate the type of instructional units to the philosophy of education referred to at the outset of the article. By no means should the experience of years in planning be scrapped, but added to this valuable experience should be the savor of the 1948 model generation to which the young people being educated belong.

Older Youth and Adult Education Facilities

This section, like that on social and recreational facilities, might well be combined with others in this series except for the matter of the emphasis which their place in the modern school program requires.

Whether or not the local school district actually plans to organize a program for grades 13 and 14 or whether a more informal program will be offered in terms of vocational, cultural, and general education courses, definite planning should take place to provide facilities for older youth and adults.

Too often adults become disgusted with hard undersized furniture, accommodations that have a juvenile atmosphere, and the like. Business and industrial workers are accustomed to solving their occupational problems in an informal atmosphere around the coun-

sel table. Simulation of such practical conditions will create an attitude and interest in adult activities not obtained when the adult group is thrust into regular day-school facilities.

If the classrooms and departments are modernized, as has been suggested, many of them will serve for older youth and adult activities, since they will meet the conditions described in the previous paragraph as desirable for post-secondary work.

All modern secondary buildings should provide functionally for older youth and adult education or make definite plans for such in the future by additions or modifications.

This is one of those areas where it is impossible to list facilities that will be needed. Local needs will determine the extent to which facilities may be used in duplicate. A distinct possibility arises here, since many older youth and adult activities will occur during hours when they do not conflict with regular day school.

As in the case of the recreation and social areas, school administrators are not as familiar with these needs as with those of the regular school program; thus help will frequently be needed from community groups and specialists in this area if the building is to have the characteristics which it requires.

Personnel Facilities

During the past few years the fields of educational guidance, counseling, testing, health, and remedial procedures have taken on such significance that to ignore them in characterizing the facilities of the modern high school would be to leave out the heart of the institution.

Formerly the personnel facilities consisted of a principal's office and usually inadequate housing for his immediate assistants. Now in the modern school, and increasingly will it be true in the future, the personnel program will require special housing adapted to the nature and spirit of the services offered.

In no phase of the building setup should there be greater flexibility, more sensitivity to the needs of the students, and more effort made to create an atmosphere of confidence and understanding. This requires practical yet homelike conditions, where confidential and pleasant relationships may be developed between teachers and students.

Size of school and degree of specialization in the services mentioned, as well as resources, will determine the nature and extent of the facilities. No phase of the school building will so well reflect the spirit of the school as the quarters that house these vital services, since they represent the individual-need philosophy stressed in such statements of function and purpose as those referred to at the outset of this article.

Ideals in Practice

This article, representing the author's philosophy of secondary education as it is related to the character of the school building, has been somewhat difficult to present since the element of spirit is as much involved as are the bricks and stones from which buildings are constructed. It has been the purpose of the article to try to develop a concept relative to the character of a modern secondary school building by discussing basic philosophy and attempting to relate it to significant areas in a modern school.

To be worth anything to the reader, it requires a translation of the concept to a given local situation and a further transition into the architect's plans and specifications to make the concept live. To the author's best knowledge, no such building as he has described is in existence, but many buildings have elements of the concept; it only remains for someone with ingenuity to combine all the elements into one structure.

Typical reaction of the less foresighted person will be that facilities of the type described will be prohibitive in cost. Actually, modern buildings with the refinements discussed are being planned at unit costs not greatly out of line with older types of construction. Extra costs come especially where added facilities are involved. These statements do not take into consideration, of course, increased unit costs caused by inflationary conditions which will affect both kinds of constructions proportionately.

Educators and architects have a responsibility to lodge modern curricular programs in buildings that will permit them to function. The author's goal has been to help himself and others see their relationship.

REQUIREMENTS OF THE MODERN SECONDARY SCHOOL

By WARD I. MILLER

Superintendent of Schools, Wilmington, Delaware

Dr. Miller has been an active and constructive leader in the educational affairs of three states. Leaving Colorado in 1940, he came to Columbia University to complete work for the degree of Ed.D. In 1941 he became superintendent of schools in Eastchester, New York, and in recognition of his achievements there, was elected to the New York Academy of Public Education. For the past two years Dr. Miller has served as superintendent in Wilmington, Delaware.

THE background for much that is to be said on this topic was laid in the address of Dr. N. L. Engelhardt, in which he described the trends that are gradually changing secondary education from a formal, single-purpose pattern of college preparation into a vigorous, dynamic, expanding program of activities closely related to the needs of maturing adolescents. He pointed out the inadequacy for the postwar world of a curriculum which requires the pupil to learn by listening, by memorizing, and by repeating statements found only in textbooks. He emphasized the fact that only as the student undergoes worthwhile experiences which have purpose for him, does genuine and lasting education take place.

In approaching the subject it was thought worthwhile to find, if possible, examples of the actual implementation of good theory in school design, places where educators, architects, and engineers had really translated advanced educational philosophy into stone, steel, and glass; where arrangements of classrooms, laboratories, and grounds expressed the point of view usually discussed but rarely laid out in blueprints. With this in mind, letters were written to a number of architects over the country asking that they send us plot designs, sketches, or actual floor plans of buildings contemplated or built in which the best educational theories were embodied. Replies received were of four kinds. Some of the men said they had nothing of this kind to send. Others said they had some ideas, but could not put them down within the time allowed. Quite a number stated their clientele were very complacent over the present situation and that the educators with whom they worked had made no suggestions of new theories or new demands. From the remaining replies, some very good materials were received. These demonstrate how the changing pattern of secondary education is gradually effecting important and significant revisions in plant design. They represent types of thinking. They are not to be considered as the only way of handling the particular item in question, nor the way that another architect working on a specific assignment might solve the same problem. They are presented as indicative of the trend which modern secondary school design is taking in the light of modern educational theory.

Change in School Population

Before discussing some of the theories of secondary education frequently mentioned, it is important to describe the students now in attendance in secondary schools, comprising young people in grades seven through fourteen, and ranging in age from twelve to twenty. It should be noted that the period of secondary education now includes the junior college. In many cities grades thirteen and fourteen are an integral part of the public school system. Some have grouped the first four years as the intermediate and the second four as the senior high. Others retain the traditional pattern of 8-4. Many have adopted the 6-3-3 plan.

Whatever the type of organization, the character of the student body has altered considerably in the past ten to fifteen years. Between 1890 and 1930 the enrollment of our secondary schools increased 1900 per cent, and in the next five years had grown another 53 per cent. It is still rising with over seven million now in attendance. During the thirties, because of the depression, boys and girls stayed in school because there was nothing else for them to do. With the onset of the war many dropped out, enlisting or getting jobs in war plants. Now they are coming back. As employment reaches the point of saturation and jobs become scarce, older men and women will replace those under twenty. While economic conditions determine the amount of schooling for many youth, it is also true that the holding power of the secondary school has increased. The importance of education during the recent war, the preferment given those with college degrees and those who had graduated from high school, made an impression on the boys and girls too young to fight and influenced their decision to continue in school.

The public secondary school now enrolls a good cross-section of our entire population. No longer can it be said that if a student lacks an I. Q. of 90 he cannot complete a high school course. Since "all of the children of all of the people" are represented in the high school, probably the average intelligence has been lowered. The range has likewise increased, extending from 75 to 150 or more. In the same way, the social, physical, and emotional characteristics of the pupils have become extremely heterogeneous. Problems of malnourishment, bad home conditions, low family income, unemployment, delinquency are now the headaches of the school administrator and his staff. Recently in Wilmington, twelve boys and girls were under investigation as problem cases. All of these young people came from broken homes. Their difficulties could not be straightened out except as home conditions were ameliorated.

The per cent of high school students preparing for college is decreasing, even though the institutions of higher learning are swamped with applications for entrance. Over the country at large about twenty per cent of high school graduates continue their education. That leaves eighty per cent who do not. About twenty per cent receive vocational education and are rather well trained for immediate employment. That leaves

sixty per cent who have been designated as the "lost section" of our high school students. Perhaps five to ten per cent of these are so poorly adjusted socially or emotionally that they do not fit anywhere and are so handicapped physically or mentally that they become the unemployables. Thus, it is seen that no special training is provided for at least half of the senior high school students. College is beyond them and they are not trained for any job.

Children's Needs Take Precedence

Modern education seeks to adjust the school program to the child rather than the reverse. As a result, diversity of offering and differentiation of course content are now accepted practices of the secondary school. The elementary school no longer retains any pupil over thirteen or fourteen years of age, regardless of his scholastic achievement. He is promoted to the junior high with the expectation that special teachers, special rooms, and special equipment will be provided to fit his needs. This pupil must be given the basic tools so that he may become a self-supporting, self-respecting citizen. At the other extreme is the junior college student who is either pursuing the first two years of a college course preparatory to professional education or completing vocational training which will equip him to be a skilled craftsman. The complexity of the modern secondary school requires a particular kind of physical plant.

Participation in and appreciation of arts and drama furnish emotional release and opportunity for personal development.

AFP Photo, Courtesy Great Neck, New York, High School

A recent survey revealed that high school graduates consider typing as essential in the business world. In more progressive schools, students are released from classes to help out part-time in the local bank and telephone office.

For the purpose of this discussion, four theories of secondary education will be mentioned. Then examples of building design required to implement them will be presented.

1. Each student shall follow a course of study known as the *Core Curriculum*, devoting from approximately seventy-five per cent of his time in the seventh grade to this common general education, to twenty per cent in the twelfth grade.
2. It shall be the aim of the secondary school to provide the kind of education each individual student requires. Individual needs will determine the course to be followed and the instructional method to be employed.
3. While "telling" has a place in instruction, it shall be replaced as far as possible by "learning by doing." The "experience" curriculum will replace the textbook. Many forms of instructional media will be used.
4. A new teacher-pupil-parent relationship is required in which the teacher becomes a guide and counselor. Parents also become important factors in the education of their children.

Content of Core Curriculum

The core curriculum is to be thought of as comprising all the kinds of education each American citizen should possess within the limits of his abilities. It includes English, social studies, health, guidance, general mathematics, and general science. As stated above, it occupies the major part of the student's time in grade seven. One teacher teaches at least two of the subjects, although others may be included. The work is carefully planned so that it is presented with unity and balance. Each subject retains its intrinsic value, but coherence and relationships are established through directed study and cooperatively prepared lesson plans. In addition to the core studies, the junior high student spends some time in the subjects designed to identify and develop individual skills and aptitudes: art, chorus, shop, homemaking, band, orchestra, public speaking, physical education.

As the student advances from grade to grade, specialization is broadened and more time is given to the subjects in which the individual has ability or interests. The general core curriculum is reduced to perhaps English and social studies. Guidance and counseling assist the student and his parents in the selection of the major fields of his preparation: mathematics, science, or language, for college preparatory students; commerce, shop, or trades for vocational pupils. In addition, time is granted for participation in such socializing, recreative, and cultural activities as art, public speaking, vocal and instrumental music, and sports.

By the time the pupil is ready for graduation or for entrance into grades thirteen and fourteen he should have undergone those educational experiences designed to assist him in his adjustment to mature living. Through the core curriculum he has established foundations of general education on which he can build his hopes and his plans for further training and his life work. Should it be necessary for him to leave school before graduation, the program must possess sufficient flexibility to allow for immediate adjustments in his courses and subjects.

The successful operation of the core curriculum plan requires class periods longer than those found in the traditional program. Class time is used for both recitation and study and, further, the combination or fusion of two or more subjects demands longer class periods. At least one hour should be allowed for each class or subject and, when combined, two if not three clock hours become necessary. Teachers must be prepared in at least two of the core subjects and in addition must be qualified to advise the pupil regarding his personal needs. Usually two or more teachers are assigned to each core unit.

As indicated above, the core plan, if properly set up, possesses considerable flexibility. Horizontally, within the scope of one year's work, adjustments are readily accomplished to fit the needs of each pupil. Vertically, the level of achievement of the pupil is recognized and the course content altered so that the instruction begins where the pupil is at any time. In the junior high school especially this diversity of offering and differentiation of course content is essential if individual requirements of the pupils are to be cared for. The great range of characteristics, abilities, and backgrounds found in present day student bodies makes this flexibility imperative. In a subject such as reading, many pupils, although assigned to the seventh grade, can read no further than on the fourth or fifth grade level; others can easily handle material customarily assigned senior high school classes. The range of reading ability in any grade frequently is as much as seven years. In the same way, the span of attention varies greatly between individuals. Some children cannot follow through a two-step assignment if made at one time. Each procedure must be directed separately. At the other extreme are boys and girls who can complete a six or seven step task with one statement of what is to be done. Nor is the answer to this situation the simple one that some pupils have learned to give attention and to concentrate, while others have not. The reasons lie in the difference between pupils, intellectual, social, emotional, and physical.

Knowledge of Background Important

As the student enters the junior high school, he brings with him a complete record of his previous school experiences. Test scores, absence, tardiness, childhood diseases, home conditions, present physical condition—all are noted and become the material with which the high school principal, teacher, and guidance counselor work. Parents are also called into conference. Data such as the following are used to plan the pupil's program, determine the kind of work he is to do, and the teachers who are to help him:

Personal

1. Native intellectual capacity
2. Physical condition
3. Social adjustment
4. Emotional stability
5. Scholastic attainments and skills

Family

1. Economic level
2. Type of family life
3. Attitudes of parents toward the child and his problems
4. Educational level of parents

From sources such as these are determined the probable length of schooling the student will have, the kind of instructional program he requires, and the special problems the boy or girl faces. Homogeneous grouping is not regarded highly at the present time. Evidence is available to show that the disadvantages of such grouping outweigh by far the advantages. Yet, for pupils on the extremes of a general distribution, perhaps ten per cent at the bottom and ten per cent at the top, many authorities believe that the special problems involved in their instruction can be better solved by putting them together with others of their kind and by giving them a special course of study taught by especially prepared teachers.

Education for the Many

The wide range of general ability of students compels the modern high school to individualize instruction as much as possible. Remedial teaching in basic subjects, corrective gymnastics for those unable to take the regular course in physical education, individual assignments, contract units and projects, are

examples of this trend. In addition, division of classes into groups for special study or for work under a student leader is often employed. Differentiation of assignment provides the means for successful completion of some task by the least able student in the class.

A track coach with one hundred boys on the squad does not put them all in the dashes, the pole vault, or the long runs. By a study of each boy's peculiar build, reactions, and aptitudes he places each aspiring athlete in the event where he is most likely to succeed. This is the pattern of instruction that should be followed by every high school.

It has been said that the world pays off on *achievement*, not on *effort*, that the spoils go to the winner, not to "the also rans." This philosophy has been introduced into our schools, until many times it appears that only those students who are going to college, who occupy student offices, who get all the "A's," who run the show, are the ones who deserve the credit and the rewards. Emphasis is placed on competition rather than extent of participation, on winning rather than on playing the game. This attitude has influenced greatly the design of school buildings and the development of school grounds. Too often plans serve to play up a few stars at the expense and to the neglect of the majority of the students. One purpose of education is the training of leaders. But it must be kept in mind that leaders emerge from the crowd through the experiences gained in the struggle, whether it be in the school, on the athletic field, on the job, or in the neighborhood. Also, that for each leader there must be many followers. As Carl Sandburg says in his poem, "the people is a caldron and a reservoir of the human reserves that shape history."

New Instruction Techniques

In addition to the organization of high school instruction into core curricula, specialized study, and personal interests, and the provision of differentiated courses to meet individual needs, the modern secondary school employs techniques of instruction markedly different from those of the traditional pattern. Contracts, projects, activities, experiences—these are the terms used to designate the varied procedures at the command of the competent teacher in reaching the goals indicated earlier in this paper. The question and answer type of recitation has been replaced by one utilizing student, parent, and faculty panels; forums; debates; group and class conferences; individual and group demonstrations; visits by entire classes to many places; exchange of student programs and exchange of teachers between schools; city-wide student conferences; and other similar devices. Instead of each pupil having the same textbook, a few copies of a number of sources are made available, thus providing arguments pro and con, points of view of several leading authorities, and putting before the student data which he must evaluate and organize before he can draw his conclusions and state an opinion.

Two conflicting attitudes have influenced greatly

AFP Photo, Courtesy Great Neck, New York, High School

Home economics should include not only cooking and sewing but home and family living, budgeting, and child care. The above picture shows one of the homemaking rooms at Great Neck, L. I., High School, Ruel E. Tucker, Principal.

Courtesy of Cincinnati Public Schools

A guidance program is needed for teacher-student relationships so that teachers can participate with students in helping them to work out their own educational goals.

the kind of approach the school has made to the problem of instructional method and course content. The first has indicated that high school pupils must be taught to *think*. The second has maintained that all controversial issues, all mention of objectionable subjects, names, and theories must be omitted from the curriculum. This has meant that pupils must learn to think in a vacuum or by dealing with matters already settled or of no vital concern to society. Questions freely discussed at home, on the playground and street, must be parked at the door of the school. Yet students graduating from high school or in actual attendance in the junior college are approaching or have reached the age when the ballot is put in their hands and they are expected to exercise intelligently the privileges of citizenship. It is unfair to these young people to put on their shoulders the burdens of our adult civilization, but it does seem reasonable to show them, under the guidance of mature and well-balanced instructors, something of the issues before and the forces at work in our American democracy.

Modern education employs at least three of the five major senses: hearing, seeing, and touch. The use of audio-visual equipment is increasing in our schools, yet only a beginning has been made. Motion pictures are still used more for entertainment than for planned instruction. But in shops, social studies, literature, and science good materials are appearing which will add much to the effectiveness and reality of instruction.

Bringing the Home into the School

The fourth trend in secondary education is that of a new relationship between parents, pupils, and the school. Since education is concerned with the development of the whole child, physically, socially, emotionally, and mentally, the home must be brought into close contact with the instructional process. For nearly fifty years the parent-teacher associations of the country have attempted to bridge the gap between the school and the home. On the elementary level fair success has been achieved, although, in my opinion, too much time and effort has gone into the raising of money to buy books and apparatus that the schools should furnish as regular equipment. Secondary school pupils, however, have looked with disfavor on the visitation of parents.

Lately a new type of relationship has developed which appears to promise much in bringing together the three elements so essential to the satisfactory growth of adolescent boys and girls. Groups of students, usually those belonging to a homeroom, a particular class, or a grade section, have invited mothers, usually, sometimes mothers and fathers, to breakfast or tea or simply to witness a program. The informality and intimacy of such a situation has served to break down the boredom and superficiality so often seen in the gatherings of hundreds of parents alone to hear some outside speaker discuss problems of adolescents whom they do not know. Pupils take pride in presenting their parents, and feel quite free to talk over such subjects as course electives, sororities, and fraternities, smoking, drinking, petting, and other problems confronting our young people. Father and son nights in the gymnasium, with the group held to such a size that all can participate, are doing much to create good will and understanding on the part of all.

Guidance has often been misinterpreted. Its aim is *not* to tell a pupil and his parents what he should do, but to put before both the information which will enable them to make the best choice. Group guidance has a place, but the most effective counseling takes place in the quiet of a teacher's or dean's office where the student alone, or the student and his parents, can go over carefully the subject at hand. Good teaching also is good guidance as it throws the responsibility on the pupil to test his abilities, exercise his powers

to their fullest, and defend his position against all comers.

Avoid Over-Specialization

A question frequently raised is, "What about vocational education? When should it begin?" As stated above, about twenty per cent of the pupils in grades nine and above elect vocational courses. To be successful in learning a skilled trade, a student should have an intelligence quotient of at least eighty. In my opinion, specialization should not begin before the eleventh grade, except for those who know they must drop out before they reach this point. For them, a brief course as thorough as possible should be provided during their final semester. But for the others, general education should continue through the end of the tenth grade. Better still, a completely vocational curriculum should be postponed until the junior college period. Vocational education is only one kind of secondary education and its isolation and separation from other types is not justified. Regional, comprehensive high schools offering vocational subjects are needed today. A few years ago, Judd discovered that many vocational schools, after a period of operation, added many general subjects. This is as it should be. In Wilmington the vocational school is one of the best in the country. It is operated as a completely vocational institution. Yet, recently requests have appeared asking that more physical education, art, music, and public speaking be added to the curriculum—subjects usually thought of as part of general education. Education should serve as a

Photos Courtesy Los Angeles City Board of Education

Many schools open their facilities to the community for instruction in canning.

Adults feel the need for instruction in how to enrich their leisure time.

cohesive rather than a divisive force in our society. To educate workers only in job techniques, to educate our professional men only in management and finance, is to develop a cleavage which may have disastrous consequences. A large part of our students need vocational training, but they also need to learn to live as citizens.

In Terms of Building Facilities

Now what do these four theories of secondary education mean in building design? In the first place, they require adequate and careful planning. As examples of the kind of planning suggested, attention is directed to the reports prepared for Austin, Texas; Kingston, Mass.; San Luis Obispo, Calif.; New York City, and others. Under the capable leadership of expert consultants, boards of education, school administrators, teachers, parents, and community leaders spent months laboring cooperatively in planning new plant projects. The heart of such deliberations is the educational program, the purposes for which the building is built, and the functions it is expected to perform. The first consideration, of basic importance, is the site.

Site Considerations

Much will depend on whether the school is located within the limits of a city or situated in a suburban or rural community. It is impossible to provide space for buildings needed in many cities without closing streets, shutting off utilities, and condemning and wrecking buildings already established. For secondary schools it would seem that a site should be at least 20 acres up to 50 or more. Some school systems have farms operated by the department of vocational agriculture. Others possess camps to which students go on weekends and holidays, not only during the summer, but throughout the school year. These are maintained and supervised by the public school authorities. It is important that regardless of size, specific plans be made for the effective use of the entire space that is available. At the present time, a junior high school is planned for the city of Philadelphia which will be placed on a site of 46 acres.

The location of the building will determine somewhat the availability of land. If placed in the outer regions of the city it is more likely that an adequate site will be available at a reasonable price than if it must be established in a rather thickly populated area. One advantage to the location of a school placed in the outer part of the city is that travel to and from school will be carried on in the opposite direction from travel to and from work. As a result, public transportation facilities can be used more effectively than would otherwise be possible.

In the development of the space around the building, the board, the administration, and the architect should consider the educational plan in its entirety; particularly that which relates to community use, intra-mural programs, interscholastic athletics, and parking areas. With increased use of buildings by the general public, parking is becoming a problem. Too often we see the crowding of automobiles for blocks around a school whenever there is an entertainment, or a game, or when adult education classes are being held. The parking space that is not needed during the day for faculty and student cars should be adapted to other uses so that the entire area may be employed effectively in carrying out the program of the school.

Recreational and athletic facilities should be planned to include every student in the school. Much will depend upon the manner in which the administration works out student schedules and daily programs. Both during and after school hours provision should be made for students to use many types of facilities. Winter sports can be carried on in the same area where summer games are played if planning is done in advance. Participation of all students is emphasized in secondary education today so that architects and school authorities should plan the site as carefully as they do the interior of the building. Restriction of facilities to competitive athletics is not justified in a modern program. Night sports are becoming so popular that provision should be made for lighting the grounds and for seating large numbers of people.

Campus Arrangement

The site and topography of the plot available, the financial ability of the school system, and the climate of the area in which the school is located are important factors in the decision as to whether a campus arrangement of the building is desirable. If a secondary school is to include Grades 7-14, the division of students according to age, maturity, and level of accomplishment may require separate buildings. Some schools attempt to meet this need by means of wings or sections. If the junior college is to be established on the same grounds as the usual secondary grades, it is perhaps desirable to separate the older pupils from the younger and to establish their work in a separate unit. For a small community, the campus plan of the schools of Dover, Delaware, represents one of the best that has been worked out.

The arguments in favor of the unit plan are those of economy, lower maintenance costs, and the additional space available for site development. Probably the decision in this matter will be determined by local conditions. There are several examples of schools which place on one site elementary, secondary, and junior college grades and seem to be carrying out the program satisfactorily.

Implementation of Theory of Instruction

As indicated above, the core curriculum requires a general workroom, sometimes called a multi-purpose room, to make available the variety of facilities necessary for this type of class instruction. The workroom should be at least 2000 square feet in size, equipped with a stage at one end and surrounded by smaller rooms to be used for conferences, counseling, visual education, libraries, supplies, and teachers' offices. Sometimes these units have been called "general education rooms."

In the operation of the core curriculum it seems advisable to provide a library for each core unit and to modify the large, central libraries now found in secondary schools. Furniture will consist of movable desk chairs and many tables. With two or three teachers working with from 50-75 students, groups should be assigned to the smaller workrooms according to plan. In the same way, a darkroom for motion pictures and other visual aids should be made a part of each core unit. The stage is necessary in

order that forums, panels, demonstrations and similar instructional devices may operate effectively. Bulletin boards, storage space, and display cases are a basic requirement.

A suite of rooms such as indicated above should not be a collection of classrooms of the traditional type. Each room should be functional and should be equipped for the specific type of instruction with which it is to deal. In the science suite there should be a library, a room for audio-visual equipment, a herbarium, and animal cages and pens, in addition to the laboratories for biology, physics, and chemistry. In the general workroom there should be ample equipment for demonstration work either by the instructor or by students.

In the homemaking suite there should be an apartment which should be utilized not only by the school, but by parents in the community. Child care, home decoration, and consumer education should be provided for through specific room and equipment facilities. There should be a nutritional laboratory in addition to the usual food and clothing laboratories. This unit should also have its own library.

In the social studies suite there should be a large general workroom surrounded by a number of smaller rooms for group study and for conferences. The library should be adequate and the stage large enough for a sizable number of students. If the traditional classroom is to be provided, it should be only one of a number of kinds of facilities that are to be made a part of one suite. A variety of rooms and types of furniture will permit many types of group instruction and permit teachers to meet individual needs.

Rooms for Parents and Teachers

The auditorium usually found in high schools will probably continue to be necessary. In addition, however, there should be provided smaller rooms suitable for meetings of parents and pupils, accommodating up to 100 persons. There should be provided some upholstered furniture, carpet, and drapes. There should also be facilities for the preparation and serving of luncheons or light refreshments. The furniture should be of such size that both parents and students will find it comfortable.

Space should also be provided for conferences between parents and teachers. If a teacher cannot have her own office, there should be a place where she can consult with parents and pupils privately and without interference with the work of the custodian or other people. It is preferable that each teacher be given an office and a desk so that she can have a place to work—uninterrupted and without distraction. Files should also be provided for the teacher's use in keeping students' records and reports.

These facilities are in addition to the usual teachers' rest rooms which are now to be found in most modern schools.

Thus it seems the modern secondary school with a program which utilizes to the fullest the best of educational theory requires a building designed especially to suit its purposes. Traditional building styles restrict if they do not altogether prohibit the implementation of good theory. It is to be hoped that working together, architects, engineers, and educators can persuade boards of education and the public that new wine requires new bottles.

COLLEGE AND UNIVERSITY BUILDING NEEDS

By ERNEST V. HOLLIS

and J. HAROLD GOLDTHORPE

United States Office of Education

Dr. Hollis came to the Office of Education with an extensive teaching background. He is a graduate of Mississippi State College and earned his A.M. and Ph.D. at Columbia University. As Chief of Veterans Educational Facilities Program Dr. Hollis is engaged in transferring war surplus buildings, estimated at one billion dollars, to schools and colleges.

A product of Minnesota public schools, Hamline University and the University of Minnesota, Dr. Goldthorpe has instructed in numerous western universities. Previous to his position in the Office of Education he served in the American Council on Education and in the State Department. He is now preparing a bulletin with Dr. Hollis on school building needs.

AMERICAN colleges and universities have 341,550,000 square feet of building space and need an additional 265,000,000 square feet in order to accommodate enrollments anticipated by 1950. This proposed increase of 78 per cent in the present plant is approximately equivalent to 133 Empire State or seventy-six Pentagon Buildings. At 1948 prices the additional space would cost approximately $2.65 billion. With land, equipment, and miscellaneous costs added, the total would exceed $3.5 billion. In addition, provision must be made for obsolescence cumulated during the war, for the customary loss of buildings by calamities, for higher educational standards, and for the plant needs of new institutions. These capital costs added to the preceding estimates would bring the total to $5 billion.

The tremendous demand for more educational and residential housing has been brought about by the enrollment of nearly a million more students than the prewar plants accommodated. The shortage has also been intensified by the inability to replace obsolescence or losses of buildings during the war, and by the necessity for housing new programs required in providing education for veterans. College plants built for a prewar peak gross enrollment of 1,500,000 students were in the fall of 1947 accommodating in some fashion a total of 2,340,000 students, and college officials expect a gross enrollment of 2,675,000 students by 1950.

Gross figures on building space in relation to enrollment are more easily comprehended when they are shown as the number of square feet of space per student. This ratio is more accurate, for the country as a whole and, with a dozen or so exceptions, for individual institutions, if it is expressed in terms of *full-time* enrollment at a given period instead of by cumulative annual enrollment, which does not reflect the number of students enrolled at any one time and which also usually includes part-time and extension students. Buildings and equipment obviously are needed only for the largest number of students present at any one time. Such ratios are also made more meaningful by separating residential from educational space because institutional responsibility for the two types of housing is determined by different general and local factors.

Summary figures in the preceding paragraphs and the more detailed analysis which follows were made possible through a survey of existing and needed building space, conducted by the Veterans Educational Facilities Program. The VEFP, administered jointly by the Bureau of Community Facilities of the Federal Works Agency and the Division of Higher Education of the U. S. Office of Education, has responsibility for providing war surplus buildings, equipment, and supplies to schools and colleges which require them in providing programs of education for veterans. For its administrative purposes, the VEFP asked 1,386 participating colleges, which enrolled 96 per cent of the nation's 1947 college population, to list their present and needed (by 1950) building space by uses (classrooms, laboratories, storage, etc.) and to relate the total to actual and expected enrollments up to 1960. Institutions which enroll the unreported 4 per cent of college students are estimated to have 16,000,000 square feet of space and probably will not need additional buildings for expansion. The space reports are for the most part a combination of estimates and

actual measurements, but even crude figures have not heretofore been collected on a national basis in the field of higher education.

The remainder of this article is devoted to an analysis and synthesis of some of the data supplied for the VEFP survey. A more comprehensive report will be issued as a 1948 bulletin of the United States Office of Education. In order to avoid confusion perhaps it should be stated at this point that figures quoted from the VEFP survey in Volume V of the reports of The President's Commission on Higher Education were from a preliminary tabulation. Moreover, inasmuch as the VEFP survey was not concerned with the total program that *ought* to be offered in higher education, nor with the total number of students who *ought* to be served, it does not estimate building needs in terms of a comprehensive ideal program. It merely reports the present intentions and ambitions of leaders for the colleges and universities they now administer.

Materials which follow are organized to show present and needed building space separately for educational purposes and for residential housing. The section on educational space shows by use and by types of institution the distribution of present and needed space. It also indicates what the Federal Government and the institutions themselves are doing now to meet the emergency. The section devoted to residential housing presents a more condensed statement of the pertinent facts on housing for single and married students, for faculty members, and for non-professional staff members.

Educational Space

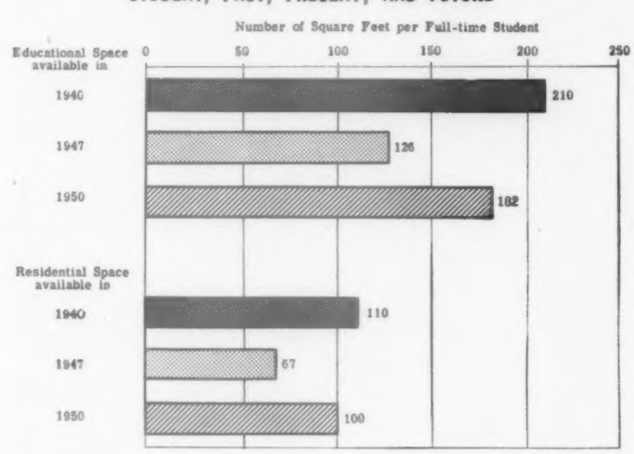
In estimating the need for additional educational space the obvious beginning point, aside from enrollment, is a determination of how many square feet of such space colleges and universities now have. But prior to the VEFP survey in 1947 it was not possible to list for the nation or any of its political subdivisions the per student or gross amount of existing space, much less to show a distribution of the space by types of institutions and by major types of use. This section will present such status figures in square feet for their normative value in appraising statements of additional need.

Educational space is used, in the absence of more exact nomenclature, to include all college structures other than those required as residential housing for students and staff members. The 222,500,000 square feet of present educational space, for example, includes maintenance, service, and other auxiliary space as well as that used for instruction, research, and administration. The five types of institutions of higher education are those used in grouping institutions in the U. S. Office of Education *Directory*. The twelve major categories of space use follow such well known designations as classroom, library, laboratory, and the like.

Distribution by Types of Institution

Table 1 shows the distribution among five types of publicly and privately controlled colleges of the 222,-500,000 square feet of space which was available for educational purposes in the spring of 1947. While

COLLEGE AND UNIVERSITY BUILDING SPACE PER FULL-TIME STUDENT; PAST, PRESENT, AND FUTURE



The relative adequacy of existing and projected educational and residential housing per full-time student for the years 1940, 1947, and 1950 is shown graphically above. The 210 square feet per student for the year 1940 is not based upon an actual census of building space but is estimated upon the assumption that the colleges in 1940 had substantially the same amount of building space reported in March 1947. Space per student shown in the chart, of course, is not net instructional space; it includes service, maintenance, and other auxiliary buildings. Full-time student figures of 210 square feet for educational space and 110 square feet for residential space indicate estimated prewar status rather than standards or norms that are recommended for judging the quantitative adequacy of future buildings.

TABLE 1

EDUCATIONAL BUILDING SPACE BY TYPE OF INSTITUTION, 1947

(Gross Space in Thousands of Square Feet)

Type of Institution	All Institutions		Publicly Controlled Institutions		Privately Controlled Institutions	
	Amount	Per Full Time Student	Amount	Per Full Time Student	Amount	Per Full Time Student
All Institutions	222,489	126	119,738	124	102,751	128
Universities	104,316	120	64,446	121	39,871	117
Colleges of Arts and Sciences	52,875	128	9,045	114	43,830	131
Professional and Technological Schools	27,249	161	14,825	172	12,423	150
Teachers Colleges and Normal Schools	19,687	143	18,974	144	713	137
Junior Colleges	18,362	102	12,448	91	5,914	130

TABLE 2

COMBINED PRESENT AND ADDITIONAL EDUCATIONAL SPACE NEEDED BY 1950

(Gross Space in Thousands of Square Feet)

Type of Institution	Present and Needed Educational Space						Needed Additional Space		
	All Institutions		Publicly Controlled		Privately Controlled				
	Grand Total	Per Student	Total	Per Student	Total	Per Student	Total	Publicly Controlled	Privately Controlled
All Institutions	391,763	182	219,781	181	171,982	183	169,274	100,043	69,231
Universities	181,611	180	118,555	183	63,056	174	77,295	54,109	23,186
Colleges of Arts and Sciences	92,626	180	17,435	169	75,198	183	39,751	8,391	31,360
Professional and Technological Schools	46,905	226	26,308	234	20,597	216	19,656	11,482	8,174
Teachers Colleges and Normal Schools	33,658	180	32,268	179	1,390	215	13,970	13,294	677
Junior Colleges	36,964	157	25,215	144	11,748	192	18,602	12,767	5,834

comparisons of present space among the several types of institutions are meaningful, *per se*, the primary purpose of Table 1 is to establish a frame of reference for use in interpreting the distribution of additional educational space (See Table 2) which 1,386 colleges declare they need now and for increases in enrollment expected by 1950. The fact that the 1947 ratio of 126 square feet of floor space per student is 40 per cent less than the 1940 figure of 210 square feet per full-time student indicates that nearly half of the 169,000,000 square feet of additional space (See Table 2) is needed immediately, unless veterans and other postwar students are to be more crowded than were prewar college and university students. If colleges get the amounts of additional educational space and the enrollments they envision by 1950, Table 2 indicates they then will have only 182 square feet per full-time student, which is 14 per cent less than was available in 1940.

From an isolated study of the distribution of needed additional educational space which is shown in the first column of figures in Table 2, one would conclude that "the big get bigger" applies to educational institutions as well as to business corporations. Universities and related institutions of complex character, for example, are asking for nearly half of the total of additional needed space. But when the first column of figures in Table 2 is studied alongside the first column of Table 1, which shows the distribution of present space, it becomes evident that universities do not envision a rate of expansion as great as junior colleges. It is also significant to note that except in the arts and sciences category of institutions, approximately two-thirds of the capital outlay for buildings may be ex-

TABLE 3

PRESENT EDUCATIONAL BUILDING SPACE CLASSIFIED ACCORDING TO USE

(Gross Space in Thousands of Square Feet)

Use of Space	All Institutions		Publicly Controlled Institutions	Privately Controlled Institutions
	Total	Per Full Time Student		
All Facilities	222,489	126	119,738	102,751
Classroom	52,740	30	26,267	26,473
Laboratory	35,563	20	19,330	16,234
Instructional Shop	7,025	4	5,297	1,728
Administrative and Faculty Office	19,165	11	10,155	9,010
Library and Study Hall	17,054	10	7,701	9,353
Cafeteria and Food Service	11,851	7	5,848	6,003
Gymnasium	24,868	14	13,401	11,467
Auditorium	10,102	6	4,934	5,168
Student Center	7,059	4	4,131	2,927
Infirmary	7,418	4	3,673	3,744
Service and Maintenance	12,539	7	7,074	5,465
Miscellaneous	17,105	9	11,926	5,179

pected to come from taxation rather than from gifts and bequests. Many readers will marvel at the optimism and courage which impels privately controlled colleges to increase their facilities by one-third when they know that such expansions increase the difficulties of securing adequate current support. Privately controlled colleges typically raise more than one-fourth of their current operating budgets from philanthropic sources.

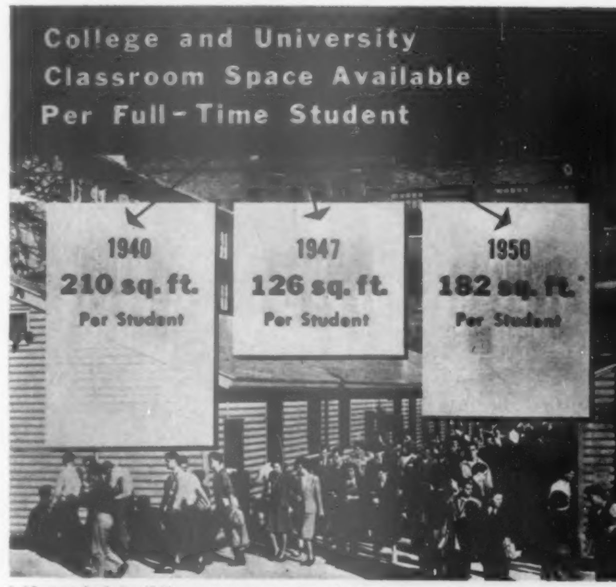
The factual comparisons and inferences that may be drawn from a study of the space distributions shown in Tables 1 and 2 are limited primarily by the interest and ingenuity of the reader. He may, for example, be interested in drawing inferences from the fact that publicly controlled institutions have 54 per cent of existing educational space and expect to erect two-thirds of the total additional needed space. He of course will also note that publicly controlled institutions now have less space per student than private colleges and expect to have less in 1950. Other readers may be interested in pondering the meaning for the future of the 1947 and 1950 distributions of space among the five types of institutions shown in Tables 1 and 2. The initiated will not need to be reminded that in laboratory and shop space per student, professional and technological schools exceed other types of institutions, or that the small amount of actual space in public junior colleges is accounted for in part by space in buildings which they use jointly with high schools but cannot report as their own. Table 2 makes it evident that they are planning to correct the current space deficiency.

Distribution of Space by Use

Architects and contractors as well as educators plan buildings and estimate costs primarily in terms of the use to which space is to be put. Equipment manufacturers and contractors also arrange production schedules according to the nature and quantity of space to be made available for educational use in a given period. In projecting building needs for the enrollment at a designated institution it is, accordingly, important to know the amount of space per student commonly allocated for classrooms, laboratories, and the like. In planning for the space needs of an individual college it is also useful for normative purposes to know the prevailing national pattern of gross space distribution by major functions.

Table 3 shows by twelve common categories of use the distribution of gross space devoted to educational purposes in 1947. It also shows as a ratio of gross space to full-time enrollment, the number of square feet per full-time student. Publicly controlled colleges had 54 per cent of the total space, and the only significant variations by categories show public colleges had a predominant proportion of instructional shop and miscellaneous space while privately controlled colleges had 55 per cent of the library and study hall space. The pattern of distribution among the twelve types of space shows that slightly less than one-fourth of all college educational space is used for classroom purposes, one-fifth for laboratory and instructional shop, with gymnasiums being the only other category to receive more than 10 per cent.

The prevailing pattern is evidently acceptable to college officials as is indicated by the distribution of



* If needed buildings are constructed

* If needed buildings are constructed

U. S. Office of Education, Federal Security Agency

TABLE 4

COMBINED PRESENT AND ADDITIONAL EDUCATIONAL SPACE NEEDED BY 1950

(Gross Space in Thousands of Square Feet)

Use of Space	Combined Present and Needed Space		Needed Additional Space		
	Total	Per Student	All Institutions	Publicly Controlled Institutions	Privately Controlled Institutions
All Facilities	391,763	182	169,274	100,043	69,231
Classroom	88,996	41	36,256	22,212	14,044
Laboratory	66,122	31	30,559	19,163	11,396
Instructional Shop	14,631	7	7,606	5,929	1,677
Administrative and Faculty Office	29,486	14	10,321	6,072	4,249
Library and Study Hall	31,200	15	14,146	7,416	6,730
Cafeteria and Food Service	19,291	9	7,440	4,083	3,357
Gymnasium	46,669	22	21,801	11,076	10,725
Auditorium	18,917	9	8,815	4,485	4,330
Student Center	18,653	9	11,594	7,182	4,412
Infirmary	13,315	6	5,897	3,263	2,634
Service and Maintenance	20,432	10	7,893	4,879	3,014
Other	24,052	11	6,947	4,284	2,663

needed additional space which is shown in Table 4. When the amounts of present and needed space are consolidated, the projected pattern is very similar to the actual one. There is a slight tendency to increase the proportion of space devoted to student centers, gymnasiums, libraries, and laboratories. These new emphases perhaps reflect the regimen of training and recreation provided by the Army and Navy during World War II.

Space Provided by Federal Government

Neither sufficient funds, building materials, nor equipment has been available from commercial sources to provide the 169,274,000 square feet of additional educational space as rapidly as it has been needed to overcome shortages due to increasing enrollments. In the spring of 1947, colleges reported assurance of only enough funds to construct 26 per cent of the building space they needed, and this assurance included commitments of the Federal Government to provide temporary buildings from war surplus structures. This section sketches what the Government is doing to meet emergency needs and the succeeding section outlines the effort colleges are making to provide more permanent buildings for educational purposes.

College and university need for additional space due to the enrollment of more than a million veterans became so urgent that in August 1946 the Congress authorized the U. S. Commissioner of Education to make a determination of actual and impending shortages of educational buildings and equipment. There was appropriated to the Federal Works Agency $84,650,000 for administration and for use in dismantling, removing, and re-erecting on school and college campuses available war surplus buildings required to meet the needs certified by the Commissioner of Education. At the end of 1947 the Veterans Educational Facilities Program, which is administered jointly by the U. S. Office of Education and the Federal Works Agency, had determined that acute shortages of buildings required in providing a program of education for veterans existed in 1,150 institutions in the amount of 23,000,000 square feet. At that time the federal Works Agency had completed or had under construction 16,500,000 square feet of space to which most of its appropriation had been allocated. The federal expenditure to date has averaged approximately $5.00 per square foot or 33 cents per cubic foot, and has provided facilities estimated to be worth $150 million. This emergency program has given institutions of higher education 38 per cent of the 44,000,000 square feet of educational space for which the VEFP survey indicated they had funds or other means available.

In addition, colleges and universities have secured from WAA perhaps $100 million worth of land, buildings, and equipment through the Surplus Property Utilization section of the U. S. Office of Education. A considerable part of the equipment has been donated by the Army, Navy, and other federal owning agencies but the land and buildings have been provided through the real property disposal unit of the WAA. Counting only the transfers where WAA fair value exceeded $100,000 each, at the end of 1947, forty-two publicly and privately controlled colleges and universities in twenty-two states had received 40,620 acres of land, 2,850 buildings, and large amounts of equipment for use in both educational programs and residential housing. The WAA fair value of these transfers approximated $32 million but the cost to institutions of higher education was only $1,231,000. It is estimated that 65 per cent of this federal contribution to the capital needs of colleges should be credited to educational purposes and 35 per cent to residential housing for single and married students and faculty members. Title to most of this property has been obtained subsequent to the March 1947 VEFP survey. Moreover, it does not include facilities made available by WAA to colleges for temporary use pending the construction

of permanent facilities of their own or transfer of title to the institutions.

Space Provided by the Colleges

It will be recalled that in March 1947 college officials had no assurance of funds for three-fourths of the educational buildings they needed by 1950. The temporary buildings provided by the Government were admittedly a costly stop-gap measure aimed at enabling the colleges partially to keep pace with increases in enrollment until they could get their own permanent building programs underway. Even though it is generally acknowledged that some of the "temporary" buildings will be in use twenty-five years hence, it is equally clear that most of them must be replaced in from five to eight years. Therefore, unless funds for permanent construction become available at an accelerated rate, colleges will be able to do little more by 1950 than replace temporary buildings, structures obsolescent when we entered the Second World War, and buildings normally lost by fire and other major calamities. This fact is pointed up by noting that when the Government contribution to assured educational space is deducted, the colleges reported funds available to build only 16 per cent of the additional space they need. These funds would add only 12 per cent to the space they now have.

Subsequent events indicate that college officials were both timid and conservative in estimating the additional funds taxpayers and philanthropists were willing to provide. The February 1948 issue of *Fortune* estimates that the privately controlled colleges of the country are attempting to raise $2 billion for endowment and capital outlay purposes. Since the close of the war, state legislatures and other tax appropriating bodies have been asked for at least an equal amount for capital outlay purposes. California, for example, has appropriated $100 million to its state university for these purposes. Nevertheless, in March 1947 the college leaders of the country reported resources which would provide only $275 million worth of educational buildings.

In order to get an estimate of the change in outlook and building activities of college officials between March and October 1947, and to sample the effect of inflation in building costs on the actual expenditure of available funds, the Veterans Educational Facilities Program made a spot check on the situation in 106 colleges and universities located in forty-three states. These institutions, evidently in better circumstances than the average, had approximately one-fourth of all educational space available in 1947 and enrolled one-fifth of the students then attending college. They reported that $240,300,000 was available for capital outlay purposes, and that $80,250,000 of this amount was under contract or in actual construction. Inasmuch as this group of institutions also had been authorized to spend $42,300,000 for self-liquidating projects, it is estimated that not more than a minor portion of the $240,300,000 was allocated to residential housing for students and faculty.

Shifts in the building activities and intentions of the 106 institutions between March and October 1947 is indicated by the fact that approximately 3 million square feet of additional educational space had been completed. This represented an increase of 5.3 per cent over the educational space available in March. Moreover, within this six-month period these institutions added 5,280,000 square feet to the space for which they had assurance of funds for early construction. Furthermore, the sights of their leaders had been raised to the point of adding 17,663,000 square feet of needed space for which at the time they had no plans for financing.

It is not statistically feasible to use the findings from the 106 colleges and universities as a sample for estimating comparable figures in the nation's colleges as a whole. One may be sure, however, that the improved situation which characterized these institutions is not true to the same degree for the other colleges which enroll four-fifths of the students. Nevertheless, the sights of the leaders of the rest of the colleges have undoubtedly been raised to meet the tremendous task they face.

Residential Housing

According to the 1947 VEFP survey of 1,386 colleges which enrolled 96 per cent of the students, 119,060,000 square feet or approximately one-third (35 per cent) of the total building space was in the form of residential housing for students and staff members. One-fourth of the colleges and universities did not maintain any form of residential housing. Among colleges which provide such facilities, the character and amount of living quarters seem to be governed largely by size and character of the community, by

TABLE 5

COMBINED PRESENT AND ADDITIONAL RESIDENTIAL HOUSING SPACE NEEDED BY 1950

(Gross Space in Thousands of Square Feet)

Type of Residence	Combined Present and Needed		Present		Additional Needed	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Totals	214,629	100.0	119,060	100.0	95,559	100.0
Single Students	138,627	64.6	80,677	67.8	57,950	60.6
Married Students	43,364	20.2	20,182	17.0	23,182	24.3
Faculty Members	27,317	12.7	14,784	12.4	12,533	13.1
Miscellaneous	5,321	2.5	3,417	2.9	1,904	2.0

location, by institutional resources, by institutional policy, and by type of institution.

The colleges reported a need for $95,559,000 square feet of additional residential housing, which is 80 per cent more than their present residential space. Because of the operation of the factors mentioned in the preceding paragraph, the space per full-time student is not nearly as meaningful an index for residential space as it is for educational space. Nevertheless, there may be some normative value knowing that in 1947 there were 67 square feet of residential housing per full-time student enrolled (not per student housed). If colleges secure the needed additional space, together with their present space, the total of residential space in 1950 will be approximately 100 square feet per full-time student. State and regional variations in space per student for 1947 and 1950 are shown in Table 6.

Table 5 shows separately for four major groups of persons the present residential space alongside the additional needed, and the total of the two categories. About two-thirds of the 1947 space is in the form of accommodations for single students, one-sixth for married students, and one-eighth for faculty members. If the colleges succeed in financing and constructing the additional residential space needed to accommodate their enlarged student bodies, the proportion of space available to the different groups housed will vary only slightly from the 1947 pattern of distribution. Specifically, there will be an increase from 17 to 20 per cent of the total residential space allocated for married students and their families. It of course must be remembered that the 1947 pattern of housing probably differed markedly from the 1940 pattern because at least eighty per cent Federal Public Housing Authority (FPHA) accommodations were for the families of married veterans.

Residential Space Provided by the Government and the Colleges

To assist the colleges in meeting the housing needs of veterans and their families, the Congress authorized FPHA to engage in a re-use housing program. At the close of 1947 it had spent $156,000,000 in dismantling, removing, re-erecting, and equipping war surplus buildings for residential use by veterans enrolled in colleges. Under this program, FPHA provided and equipped about 7 million square feet of temporary dormitory space for single students and approximately 31 million square feet for family accommodations. In addition to its federally financed veterans re-use housing program, FPHA transferred to colleges title for additional buildings and equipment which were moved by the institutions without expense to the Federal Government. As the law authorizing residential structures provided by FPHA now stands, these buildings must be dismantled by July 25, 1949. Of course the statute may be amended to permit longer or unrestricted use.

Through the educational benefits program of the Real Property Division of War Assets Administration, sketched in an earlier section of this article, colleges received on-site transfers of land, buildings, and equipment for student and faculty residential use. The WAA fair value of these transfers is estimated to exceed $11,000,000. Moreover, WAA has given colleges interim permits and short-term leases (at nominal costs) to use for the emergency as much other federally owned residential housing as has been transferred to them.

At least $1 billion would be required to build the 95,558,000 square feet of residential housing still needed in March 1947. Perhaps one-fifth of this need is being supplied for the time being by the FPHA Reuse Veterans Housing Program. In the spring of 1947, colleges indicated they were assured of 36,342,000 square feet of temporary and permanent residential housing. This leaves the majority of the need still unmet.

Data from the partial re-survey of 106 colleges and universities, referred to in the preceding section, indicated that between March and October 1947 they had added 4,130,000 square feet to their housing facilities. Perhaps most of this increment came from FPHA re-use housing and represented a 15 per cent increase over the housing the same colleges reported in use in the spring of 1947. Moreover, they also added 5,500,000 square feet to the March 1947 estimate of needed residential housing. Thirty of these colleges and universities reported that they had been authorized to issue revenue bonds for self-liquidating projects, mostly dormitories. These colleges, which are not waiting for gifts or appropriations to finance their needed housing, have secured from their respective legislatures and boards of control, authorization for $42,300,000 of such bonds. During the calendar year 1947, they have had issued $18,500,000 of the total amount authorized.

Distribution of Space by States

When the people of a state are shown data on the national building situation of colleges, they usually want to know the position of their own state or region in relation to the nation. Legislators, financiers, educators, architects, contractors, and business firms which provide equipment, furnishings, and consumable supplies for college buildings—each in his own way—have a special practical interest in seeing a geographical distribution of information on the building needs of colleges.

The state-by-state distribution of the nearly 265,000 000 square feet of space which colleges yet need for educational and residential purposes is presented in Table 6. In addition, it shows the number of square feet of both educational and residential housing per full-time student as of March 1947 and as it will be in 1950 if colleges get the additional space they say they need. In the absence of any generally accepted regional grouping of the states, the state totals were consolidated into the nine geographical divisions used by the Federal Works Agency and the U. S. Office of Education for administering the Veterans Educational Facilities Program.

The uses to which the information in Table 6 can be put are many and varied. The data for states in FWA Division 1 will be used as an illustration. Architects, contractors, and equipment dealers who consider Massachusetts, for example, in their territory may find it useful to know that the colleges and universities of the state need to add 5,512,000 square feet of space to their present plants. But it does not follow that the VEFP section of the U. S. Office of Education will send anyone a list of institutions which

TABLE 6

PRESENT AND FUTURE BUILDING SPACE PER FULL-TIME STUDENT AND THE TOTAL ADDITIONAL BUILDING SPACE

(Gross Space in Thousands of Square Feet)

FWA Division and State	Space Per Full-Time Student				Total Additional Space
	Educational Space		Residential Space		
	1947	1950	1947	1950	
United States	126	182	67	100	264,833
Division 1	147	199	85	109	37,909
Connecticut	202	220	166	187	2,690
Maine	212	265	132	146	970
Massachusetts	207	242	93	106	5,512
New Hampshire	247	353	246	261	885
New Jersey	121	226	55	69	6,769
New York	111	164	63	95	18,720
Rhode Island	147	164	98	107	968
Vermont	233	290	248	261	1,395
Division 2	119	169	56	89	36,205
Delaware	124	133	45	61	154
District of Columbia	104	131	44	73	1,975
Maryland	108	159	55	75	2,659
Ohio	98	149	59	84	10,576
Pennsylvania	132	184	56	82	10,669
Virginia	164	250	67	156	7,496
West Virginia	70	123	46	74	2,676
Division 3	140	207	98	148	42,853
Alabama	159	232	107	144	7,140
Florida	80	142	97	180	6,104
Georgia	112	187	83	135	6,068
Mississippi	139	207	132	171	4,105
North Carolina	176	244	102	147	7,937
South Carolina	157	170	95	134	3,859
Tennessee	140	237	83	135	7,640
Division 4	137	193	56	94	42,821
Illinois	149	195	42	78	11,465
Indiana	143	187	77	129	7,329
Kentucky	162	199	62	105	5,667
Michigan	124	191	58	96	13,543
Wisconsin	123	150	60	72	4,817
Division 5	129	181	52	86	28,889
Iowa	141	197	67	110	6,973
Kansas	129	156	49	85	4,520
Minnesota	129	194	45	74	6,754
Missouri	116	167	45	81	5,997
Nebraska	150	171	38	53	1,734
North Dakota	189	232	71	110	1,735
South Dakota	176	194	86	124	1,176
Division 6	96	153	69	106	27,465
Arkansas	130	175	107	126	2,322
Louisiana	101	146	85	111	3,843
Oklahoma	92	131	66	88	5,365
Texas	90	161	59	110	15,935
Division 7	96	162	46	61	22,087
Arizona	131	184	85	103	1,113
California	91	159	44	57	20,266
Hawaii	115	143	8	63	279
Nevada	192	365	158	196	429
Division 8	140	209	102	119	16,332
Alaska	385	294	214	184	121
Idaho	233	322	175	255	3,416
Montana	151	258	69	103	2,179
Oregon	116	184	154	164	3,875
Washington	129	187	57	66	6,738
Division 9	113	179	50	98	9,890
Colorado	100	169	63	89	3,623
New Mexico	117	207	82	139	2,439
Utah	130	174	15	79	2,782
Wyoming	103	207	77	145	1,046
Puerto Rico and Canal Zone	95	122	—	22	382

shows the nature and amount of space each has or needs.

Legislators, college trustees, college presidents, and business officers can also use the information in Table 6. New York or New Jersey educators, for example, may use national, regional, and state figures of residential space per student in support of New York's request for an increase from 63 to 95 square feet per student, or that of New Jersey for an increase from 55 to 69 square feet. However, it would be a misuse to argue that these two rich urban-industrial states should provide the 261 square feet per student which New Hampshire and Vermont want, or even the 248 square feet per student which Vermont now has. Legislators and philanthropists are cautioned against arbitrarily using these data to deny funds for additional construction at institutions which already have space per student in excess of national, regional, or state averages. Due to special circumstances, institutions in Vermont, for example, may be justified in seeking 1,395,000 square feet of additional building space even though the colleges now have an average of 233 and 248 square feet per student, respectively, for educational and residential purposes.

Applications of the character warned against in the preceding paragraphs violate most of the socially sound axioms on inherent differences in the space requirements of colleges due to location, size of institution, concentration and nature of population, and institutional policy. Moreover, the earlier caution on the use of status figures for normative purposes is reinforced by the inherent institutional differences listed in the preceding sentence. In developing plans for plant expansion, institutions usually are guided by their needs, aims, and resources as much as by averages which frequently conceal as much as they reveal.

A composite picture of college and university building needs for the next decade has been made from the generally conservative reports of presidents and business officers. It is not the picture of an ideal plant required to provide suitable college programs for all qualified individuals. It is the amount of space practical administrators believe is required to provide educational and residential housing for prevailing programs of higher education for the 2,800,000 students expected to be in attendance in 1960.

The VEFP report presented an analysis of the 341,500,000 square feet of plant which the colleges now have and their need for an additional 265 million square feet of buildings. It has also sketched the activities of the Federal Government in providing temporary facilities and the efforts of the colleges in building permanent structures. The difficulty in meeting the college building needs has been greatly intensified by the current inflation of construction costs, which on the average are now twice those of 1940. In addition to space provided prior to March 1947, the Government has constructed or is in the process of constructing 31 million square feet of war re-use buildings for the colleges, and the colleges themselves have funds in hand or in sight to build an estimated 48 million square feet of permanent buildings. Together this accounts for 30 per cent of their needs and is estimated to be worth approximately $1 billion.

The $64 question, which the VEFP report does not attempt to answer, is how will colleges get the $2,500,000,000 required to complete and equip the additional buildings needed or the $1,500,000,000 likely to be required for replacements, for meeting higher standards, for colleges not covered by the survey, and for new college ventures. Since two-thirds of the building space is sought by tax-supported institutions, presumably that proportion of the cost will come from taxpayers. However, no one is at all sure that taxpayers and philanthropists together will by 1950 or even 1960 be willing to add to present commitments enough funds to total $5 billion.

BUILDING FOR SCHOOL AND COMMUNITY NEEDS

By HENRY S. CHURCHILL

Churchill-Fulmer Associates, Architects and City-planners

Numerous architectural and city planning projects, here and in South America, have given Henry Churchill a wide range of experience. Some of his commissions include the State Tower Building in Syracuse, New York, the Aquackanonck Gardens in Clifton, New Jersey, and the Queensbridge Houses in New York City. The author of the book, The City Is the People, as well as many articles, Mr. Churchill has delivered lectures on housing and city planning at Harvard, Columbia, Massachusetts Institute of Technology and the University of Toronto. He has served as consultant to the Federal Public Housing Authority and the New York State Division of Housing.

WITH urban redevelopment becoming something of a possibility, and with the increase in the growth of residential areas in the outlying districts a definite fact, school boards can no longer afford to merely follow population changes when setting a policy for the location of schools. By cooperating with their local planning boards they can avail themselves of the data on population trends that the planning boards have acquired and fit the school locations into the overall planning picture. Such cooperation, which has already been worked out in a good many communities, does not deprive the school board of any of its prerogatives. It does, however, enable them to understand the way in which sound planning not only can foresee which areas are likely to grow, but also the process by which growth is guided and controlled by the techniques of zoning and subdivision control. It is obvious that intelligent acquisition of sites when property values are still low should result not only in better and more ample sites, but in considerable financial saving.

One of the reasons for the desertion of the older portions of the big cities is the decay of the public school system—particularly the inadequacy of the plant. Very often the failure of the system to meet the needs not only of the children, but of the whole community, results in migration to other communities. In general, in the smaller towns the school is much more closely integrated with the life of the community, so that even if the quality of the "formal" instruction is allegedly not of the highest, the total education is much closer to actual needs, more flexible, and enters into more varied segments of experience.

Build Schools Where the Children Are

City school boards—and those all-knowing bureaucrats in the state capital as well—might remember that fact when redevelopment projects are planned. The brilliant errors of New York City should be a warning to all other cities. New York has never integrated its vast housing program, private or public, with its school system. Huge concentrations of population have been allowed to take place through public or private housing projects; and while it is true that the school board has always been asked about the school situation, no one has ever paid the slightest attention to the board's findings. The projects have been built and the children worried about later. These projects of course will always be occupied, because they are all—private as well as public—subsidized for lower rentals than the normal market. Eventually, however, there will be redevelopment for a "normal" scale of rents, and unless proper school facilities are built the redevelopment projects must ultimately fail. People will not continue to pay high rents for inferior schools, and inadequate recreation facilities. They don't have to; they can move to greener pastures.

Ideally, of course, the school should serve all the needs of the community from childhood to old age. How important this latter will be is proved by the statistics and precasts of the increasing age of the population. It is not the only factor, however. Increased leisure time and smaller families indicate less

work to do in the home, more time to do it in, and less experience in raising children. The result will be more time for education, in the broad sense, and more need for it. Living is increasingly complex, and experience more limited, so that knowledge received from others becomes a matter of importance in the struggle for existence as well as a concern in the proper rearing of children and a source of cultural satisfaction.

Both Ends of Scale Show Increase

In 1947 the birth rate was 26.2, the highest ever recorded; and it is the culmination of seven years of startling increase. This means that schools *must* be expanded. A corresponding increase is noted in the number of old people, for whom community facilities must be provided. In 1940 there were nine million people over 65; today there are 10,600,000. The wave of children will march through the schools and on into old age. Schools, colleges and the residential areas of our cities will feel the impact.

In order to meet these growing needs, the concept of the school as a place for formal education only, whether of children or adults, will have to be modified. The school system now assumes responsibility for children, of course, and many systems have taken on a very considerable responsibility for adult education also. The future will demand that there be at least a cooperative responsibility for much more. It seems logical that the school should become the nucleus for much of the social life of the neighborhood which it serves, through cooperation with other municipal agencies and with citizen groups.

If such objectives are achieved, the school will cease to be a mere pedagogical center and will become a true community center. There will be something in it for all ages, and in it the whole family can find interest. Children, adolescents, young parents and the old folks will be enabled to fill their educational, recreational and cultural requirements at their several age levels, but together as a family.

What is implied here, from the planning angle, is a different kind of site and plant. In order to increase facilities, more land will be needed. Since a large part of the activities will be extra-curricular in nature —some, indeed, entirely so—it would not be fair to

In the park adjacent to the school, children engage in healthful playtime activities and visit the zoo during lunch and after school instead of playing on the streets.

A section of the locker room set aside for a lounge, where informal meetings of adults and pupils can be held. Room should be available at all times.

burden the school budget with the entire cost of land, buildings and maintenance. It must be a shared enterprise, a pooling of the various funds into which taxpayers' money is already distributed, gathering together physical facilities which already exist, to a greater or lesser extent, in most places.

Concurrent Hours of Study

It should be possible, for instance, for young mothers and expectant mothers to receive courses in child guidance or care during the very hours that their progeny are out of the home and in the school. Most young mothers, and indeed most older ones, can manage to get out of the house only if the children are taken care of; and that, usually, is when they are at school. Training for the mothers should therefore be provided at the same time and in the same community-building group as training for the children. This, of course, is a layman's answer to an obvious need; educators will undoubtedly see some difficulties.

The present rather superficial "clinics" might very well become places where real training could be given parents and children in meeting the common problems of colds, stomach-aches, children's diseases and minor injuries—to say nothing of giving assistance in finding and recommending aids for defective eyes, teeth, hearing and posture. It should all be part of the general routine of family education, and should include the males of the family, too. It is at this point that hobbies and vocational assistance, evenings, weekends, and in summer, would come into the program. Some parents will have none of this, particularly those who have been allowed to become maladjusted to the social content of the times, and who, through fear, would keep their children from benefits offered by a society which they distrust. These are welfare cases, and should be treated as such, within the framework of the new school-community. The processes of education, mental and physical health, and education for health insofar as they affect the child directly or through the parents should be combined.

The ways in which the school-community could serve are endless. Why should not the school cafeteria function for parents' socials in the afternoon and all summer? The older people might well be allotted a sunny reading room as part of the library—a comfortable reading room, like those the colleges have developed so admirably. Why not have informal

social rooms in which the older people—and some of the younger—could sit and chat while waiting for their children after shopping was done, or in the cooler afternoons while the children played outdoors. Must everything connected with a public school be physically unpleasant? Or stilted, out of scale, and dull?

Considerations of Architecture

Only the new architecture and the contemporary approach to planning can solve the spatial problems that will be raised by the broadening concept of the school. While so-called "flexibility" of space is largely a fetish, multiple use of space can be achieved only by the flow of space and freedom of arrangement that is made possible by the use of modern materials and equipment according to the nature of those materials and the logical functioning of the equipment.

For example, both heating and lighting can be far more efficient in rooms which do not conform to those standards set down by the deans of the profession forty years ago. The quality of light—both natural and artificial—is now a consideration as well as the mere quantity; glare, contrast and tropism have been studied and methods devised for their control; the foot-lambert supplements the foot-candle. Provision must be made for visual aids, for sound systems, for more assemblies, for more types of specialized vocational—or psychological—training. Most school auditoriums are hangovers from the worst periods of "assembly-room" design, bad acoustically and visually, inadequately equipped and over-decorated. There is no reason why they should not be charming and usable for adult as well as school purposes on a much more efficient basis than they are now. They will have to be, if they are to serve the public economically and satisfactorily.

Need for Community-wide Relaxation

Recreation must go far beyond the absurd and boring program of physical exercise presented by most city schools. Recreation is a relaxation of the mind as well as of the body, and plant, equipment, and intelligent direction must be provided for this, if only as an antidote to big-city tensions and hysteria, and as a substitute for city streets and gangs. Much has already been done, in many places (though not in many big cities), to coordinate the work of recreation commissions with the school recreation program and equipment. This is certainly a step in the right direction. More, however, could be done in the future by having the recreation commissions and school boards work with the planning boards. The acquisition of parks and school sites should go together; whenever possible the school should be located in or adjacent to a park. A higher intensity and greater diversity of use of the land would result. Professional instruction in athletics—tennis, for example—could be carried over to the adults, to the benefit of the adults and the instructors, for a fee.

Cost May Be Minor Factor

The problem of where the money is coming from is perhaps not as great as it might seem. The same question applies to all public services, and unless all public services are stopped it is fair to assume that the schools will continue to get their proportionate share of funds. As to the cost of the expanded field outlined here, much of it would be covered by the amalgamation of present duplicating efforts in diverse city departments. In fact, with intelligent planning—both economic and physical—much more might be accomplished for no greater expenditure per capita than what now goes into schools, clinics, small parks, and part of welfare costs.

This series of comments has not tried to distinguish between large and small communities, grade schools, junior high schools, high schools, or junior colleges. The impetus will come first in the grade schools, since they are closest to the people, and the enlargement of function and the way it is accomplished will vary with the circumstances of each school and its neighborhood. Naturally no one school will encompass all the possibilities. But unless the schools in new areas and in redevelopment areas are planned with an eye to their enlarged future purposes, they will be found to be as woefully inadequate, in thirty years, as our 1920 schools are today.

SCHOOL BOARDS' RESPONSIBILITIES FOR SCHOOL PLANTS

By CALVIN GRIEDER

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A native of Iowa, Dr. Grieder received his B.A. degree from the University of Dubuque. After nine years' service as teacher, principal, and superintendent of schools in various Iowa towns, he acquired an M.A. and a Ph.D. from the State University of Iowa. He became associate professor of education at the University of Colorado in 1940 and was promoted to professorship in 1945. Since 1942, he has been secretary-treasurer of the Colorado Association of School Boards, and is co-author with Harl R. Douglass of American Public Education.

BOARDS of education are in a peculiar position with respect to their responsibilities for school plants. They are vested, by state constitutions and statutes, with authority and responsibility for providing adequate school facilities, subject, of course, to various degrees of advice and regulation by state departments of education. Yet most board members cannot qualify as experts in the field of school plant, and many have little or no experience with school building planning problems during their terms of office.

The field of school plant, while very important, is only one of the many administrative aspects of a school system. Board members are not expected to possess technical qualifications as school plant experts any more than they are expected to be curriculum, financial, instructional, or any other kind of educational experts. Yet they cannot escape making decisions on school plant problems, any more than problems in other fields, for the legal responsibility for such decisions rests largely with them.

These being the facts, questions arise as to how school boards can wisely discharge their responsibilities for providing suitable school plants. The emphasis in this article is on problems related to new school plants, although the general principles set out are also applicable to the perennial problems of plant operation and maintenance.

What school boards must do, as a minimum, if they take seriously their obligation to perform well in relation to school plant responsibilities, may be listed as follows:

1. Rely on the superintendent of schools and his professional staff for leadership in every phase of the school plant program.
2. Acquire a good background of general information on planning school buildings and grounds.
3. Become acquainted with state constitutional and statutory provisions governing the construction of school facilities, and with state department of education regulations.
4. Employ technical consultative service whenever it is needed and for whatever part of the plant program it is desirable.
5. Cooperate with other public agencies whose activities have a bearing on the educational program and the development of the community.
6. Make provision for financing the plant program.
7. Provide for continuous survey and evaluation of present school facilities and of plans for the immediate and long-range development of the school plant.

Each of these seven topics is briefly discussed here.

Professional Leadership

The necessity and propriety of a school board's relying on professional leadership are not limited to school plant activity. Professional leadership by superintendent and staff is exercised and expected in all phases of educational administration where good principles of school administration are operative. Yet in the realm of school plant (as in finance and business management) school boards sometimes ignore or bypass the superintendent and take matters pretty much into their own hands. While preparing this article the writer was informed of a situation in his state where a board of education has taken the planning of a large addition entirely into its own hands. The board selected an architect, developed plans with him, set up the financial program, and so on. The superintendent, a highly competent young man, has not been consulted at all—the board seems just never to have thought of it. In this instance the results are going to be bad, unless the superintendent can succeed in having the whole program stopped, for the facilities the board has planned do not at all meet the needs of the district, and the financial program is quite inadequate.

This is a great mistake. It is not only a breach of school board ethics, but it also deprives the board of valuable counsel by one especially prepared to help them. It seems rather inconsistent, too, for a board to search out and employ an executive officer who they believe is competent, and then to forget him in such

an important administrative area as school plant planning.

It is the writer's belief, evolved from wide observation of and contact with school boards, and from long study of practice and theory in educational administration, that a board of education should look to its superintendent and his staff for leadership in *every* aspect of the management of public education. The point is mentioned here in its specific application to school plant problems. In the following paragraphs it is taken for granted that the superintendent and his associates furnish leadership for the board as it tackles various segments of the planning of school plants.

This means that so long as the board has confidence in the superintendent and his professional staff, it does not strike out on its own in meeting school plant problems, and does not initiate studies or make commitments without first having a recommendation from the superintendent. Superintendents and their associates are not omniscient, but they do have special training and experience. If a board loses confidence in their ability to render the type of leadership which is required, the professional staff should be augmented or replacements made.

Background of Information on School Plant

Although, as noted above, school board members are not expected to be experts, they ought to acquire a good general knowledge about major school plant problems, if they are to deliberate and make decisions intelligently. Here again the superintendent and his associates should be able to offer many suggestions.

A background in the school plant field can be gained through several methods. Discussions of schoolhousing problems at board meetings is one method. Visits to other districts to see how they have solved their problems is another method. Attendance at conferences on school plant problems is an excellent way to get a lot of understanding and ideas in a concentrated dose. Many such conferences are held each year in all parts of the country, by universities and state departments of education, with outstanding talent.

And probably the most fruitful of all methods is reading selected works on the subject. An alert superintendent can and will supply or recommend suitable articles and monographs. Especially rich in articles on schoolhousing problems are three journals of school administration, *The School Executive*, *The Nation's Schools*, and *The American School Board Journal*. The first two include portfolios on school plant problems in almost every issue. Other rich sources are the annual editions of THE AMERICAN SCHOOL AND UNIVERSITY, the issues of the *Review of Educational Research* devoted to school building problems, the bibliographies published at intervals in *School Life* (U.S. Office of Education), and the comprehensive bibliographies published at intervals by the School of Education of Indiana University.

For a detailed catalog of specific approved standards of schoolhouse construction, probably the best thing available is the *Guide for Planning School Plants*, published annually by the National Council on Schoolhouse Construction, available from the Secretary, George Peabody College, Nashville, Tennessee. Holy and Arnold's *Standards for the Evaluation of School Buildings* and Strayer and Engelhardt's standards for elementary, junior, and senior high schools are also useful, but not as up to date as the *Guide*.

Legal Requirements and State Regulations

In all states there are provisions governing the incurring of bonded indebtedness, tax levies, elections, and the acquisition and disposition of school sites and facilities. Half the states have school plant divisions or bureaus which exercise control ranging from very weak to very strong. The board of education should be fully cognizant that state laws and regulations do exist, and should be fairly well acquainted with the limits of their own authority and discretion. They should rely on expert service employed on a consultative, or, in large school systems, on a retainer basis, for guidance to supplement their own knowledge and that of the regular professional corps.

Expert Technical Service

Whenever it is needed and for whatever part of a school plant program it is needed, expert professional and technical service should be utilized by boards of education. The smaller the school system the greater the likelihood that some outside help will be needed. The recommendation of the superintendent should, in general, be relied upon when a board considers this problem.

In some areas of plant planning the need for expert service is obvious; e.g., the engineering, architectural and legal phases. Yet the need may be just as great in other phases such as curriculum, finance, publicity, and equipment. During construction the board should employ competent inspectorial service to make sure that contract specifications are fulfilled.

It is a wonderful thing to see how some school boards suddenly become experts in curriculum, school finance, and other fields when a major building program is in the making. It is safe to say that in practically all cases, financial waste will be avoided, better and more suitable facilities provided, and headaches saved if school boards will avail themselves of expert assistance.

In large cities, school plant specialists should be employed on a full-time basis. As the *Guide* referred to above well states: "The school plant specialist should be assigned the major role in coordinating the desires of special committees, lay groups, architects, and engineers with each other and with the budget. He should advise the responsible administrators and boards of education regarding principles of planning for health, safety, and functional adequacy."

Cooperation with Other Public Agencies

There is no compulsion, with some exceptions, for boards of education to cooperate with other public bodies in developing school plant programs. But ideally a school district should not work in isolation from other agencies concerned with public works. In most communities the state department of education can render useful service in planning the school plant, beyond the department's possible authority to approve or disapprove specific projects. The advice of state departments is of special importance currently in the many states where district reorganization is being fostered. A state department is likely to have a more comprehensive view than a local board of the

The Board of Education of Denver conferring about school building plans with superintendent and central office staff.

statewide pattern of present school facilities and those which are needed.

City plan and zoning commissions should be consulted, too, even though they may not have directive authority. The placement of schools in relation to various types of other public facilities such as parks, streets, and cemeteries should be worked out with the advice of planning boards. The spotting of sites for future schools can hardly be done intelligently without complete cooperation of school district and city planning authorities. Such cooperation is almost sure to be mutually profitable.

Both short-term and long-range planning in the light of all available data are necessary. The latter is largely neglected, as reported by the writer in the 1945 edition of AMERICAN SCHOOL AND UNIVERSITY (pp. 26-30).

The necessity of cooperation of the members of a board of education with each other is taken for granted. However, in one of the largest cities in the United States a multi-million dollar building program was bogged down because the board members could not agree among themselves on the order in which the program should be carried out.

Providing for Financing the Plant Program

In the sphere of school plant financing the board of education has a vast responsibility. It is a difficult one to discharge now because construction costs have so far outstripped the financial ability of most districts that many decisions of crucial importance must be made on what to build and what not to build. Some scale of values must be developed, rooted in a sound educational philosophy, to guide the making of such decisions.

It is perfectly proper, in view of the acute need for new facilities, for boards to agitate aggressively for state and federal aid for construction.

The purely local aspects of financing should be worked out under the leadership of the superintendent and his staff, with advice from competent persons sought when needed. As a rule, sole reliance should not be placed in representatives of investment houses. Assistance should also be sought from experts in educational finance who may be found in state education departments or in leading universities.

Continuous Survey and Evaluation

Lastly, a board of education should make provision for continuous survey and evaluation of school plant facilities and needs. In large city school systems full time personnel is required to carry on this activity. Survey and evaluation of facilities are necessary in order to ascertain how well planning has met needs, and in order to plan better in the future.

Evaluation must be related to state and local policies, community needs, and outcomes of the educational program. Since the factors involved in evaluation are variable, it is a difficult thing to do, but it should be done. If boards of education and the communities they represent are to profit from experience, continuous survey and evaluation must be carried on.

SCHOOL BUILDING SURVEY TECHNIQUES

By WILLIS A. WHITEHEAD

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and RICHARD L. FEATHERSTONE

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Mr. Featherstone is a graduate student at Ohio State, majoring in School Administration. He assists in the school building planning section of the Bureau of Educational Research. During the war, he served as Battalion Plans and Training Officer at the Field Artillery Replacement Training Center, Fort Silk, Oklahoma, and following this, taught in the public schools in Ohio.

Mr. Whitehead's particular responsibility is to serve as educational consultant in the field of school building planning, assisting school authorities and architects in the State of Ohio to solve their school plant problems. He has had wide experience in architecture, educational planning for buildings, public school teaching, and college teaching. During the war he was associated with aviation training.

THE major function of school buildings is to implement education at all levels of human development. Few persons would deny that the design characteristics of a school building exert considerable influence upon the nature of the educational program and upon the quality of learning that accrues from educational experiences. The number, kinds, and characteristics of rooms provided determine to a great extent the kinds of activities engaged in as well as the educational effectiveness of such activities. Visual, auditory, safety, and sanitary conditions in various rooms and areas affect physical well-being, and, consequently, mental processes.

Architects, engineers, and other technically-trained, professional men are responsible for the aesthetic and technical design of school buildings. The architect, assisted by his staff, studies the educational requirements for a specific building and the conditions under which it must be built and then formulates tentative plans for major rooms as well as for the building as a whole. He develops basic plans and other specifications in accordance with a scheme approved by educational authorities. He prepares working drawings and specifications and other contract documents. In many cases he supervises and administers construction phases of the building program. Engineers and technical consultants, working with the architect, design structural aspects of the building. They formulate necessary acoustical corrections for various rooms. They design mechanical and service systems. In short, they provide technical services which the architect normally is not qualified to render.

Effective architectural planning of buildings that are to implement a modern program of education must be preceded by equally effective educational planning. No architect can plan a school building, or any part of it, for effective use unless he knows specifically the nature of the various uses that are to be made of it. He must have a clear and detailed statement of necessary educational, administrative, operational, and maintenance activities. He needs detailed information concerning kinds, numbers, and sizes of rooms required. He must become aware of general building characteristics and conditions that are known to influence child development and are important to efficient building operation and maintenance. He can profit materially from the suggestions of persons familiar with the operation of a school program concerning essential qualities and characteristics of specific rooms and areas and of building details and service systems.

Architects can hardly be expected to be well versed in their own field and at the same time to be proficient in the field of educational planning. Since most of them are not conversant with educational philosophy, they are not able to interpret this philosophy for determining educational practices in the day-to-day school program, and are not capable of translating educational practices into educational requirements for specific school buildings. Educational planning for buildings is clearly a job of educators. Architects have every right to expect that the results of such planning will be furnished them.

Educational planning for buildings which are suited to house a modern program of education is a complex undertaking and requires the cooperative efforts of many individuals and groups. No one individual can be sufficiently well informed concerning

practices and trends in all curricular areas, in all divisions of the school program, and in the many community services which the modern school should provide, to undertake the task alone. Furthermore, improved staff and community relationships and more adequate use of building facilities can result from staff and community participation in the planning process. School administrators, teachers, pupils, school custodians and engineers, educational consultants, lay members of the community, recreation officials, city planners, and others can make significant contributions to the planning process. At times, the services of architects and technical engineers are required to assist educational planners in answering questions of a technical nature.

In order to insure effective results from cooperative planning, administrators and their assistants must provide leadership of the highest order. In most instances, the administrative staff can be more certain of satisfactory results if advice and assistance are secured from educational consultants who are familiar with school building problems and with suitable procedures for carrying out educational planning. In certain states, some assistance of this kind can be secured from the school building division of the state department of education. In other states, administrators can utilize the services of consultants from colleges and universities or of professional consultant groups. This article deals with procedures and techniques for determining and formulating the educational specifications for specific school buildings. It in no way attempts to solve the problems involved in determining overall school plant needs in a school district.

Pattern for Educational Planning

The character of general procedures to be followed in any undertaking depends to a great extent upon the values accepted by the person or persons developing them. Those discussed in succeeding sections of this article have been developed in accordance with the following assumptions:

1. A study of school building needs and formulation of an overall plan for the entire school plant in a community should precede the planning of specific school buildings.
2. Architects should be furnished detailed educational specifications for every building they are engaged to design.
3. Detailed consideration of current and future educational programs should precede consideration of specific school building features.
4. Procedures used in educational planning for the establishment of an educational program should be organized to utilize the services of all persons who can make contributions to or can benefit from participation in the planning process.
5. If educational consultants are employed to assist in educational planning, their functions should be to advise and assist local personnel in determining educational and building needs and to assist architects in interpreting and applying educational specifications.
6. Initial educational planning should proceed in terms of ideals and without regard for costs.
7. The basic educational specifications for buildings finally adopted should make the best possible use of existing buildings and should be feasible within the limits of funds available.

In the course of serving in the capacity of educational consultants for school building planning in numerous school districts in Ohio, the writers have found that the work involved in such planning may be divided into several stages. These are: first, initial planning of procedures and techniques in terms of local conditions; second, organization and work of local planning committees; third, analysis of data, formulation of building requirements; fourth, preparation of educational specifications for buildings; fifth, evaluation of architectural plans and specifications; and sixth, evaluation of completed buildings in terms of their use.

Initial Planning

Before proceeding with actual planning, it is necessary to consider local building needs and conditions and to formulate in some detail a pattern of procedures that can achieve desired results effectively. The school administrator, assisted by consultants and persons in key positions in the schools and the community, carefully studies recommendations for the overall school plant already approved by the board of education. This general steering group considers the types of buildings that are involved in the building program, the scope of problems that will need to be faced in determining educational specifications for them, and the kinds of information that will be required in solving such problems. They determine kinds and numbers of committees that can be utilized. They decide how committee members can best be chosen and appointed and what school and community groups should be represented on committees. They determine how committee work can be initiated and what materials can be prepared to assist committees. The steering group formulates the specific functions of various types of committees. They agree upon a basic sequence for planning operations and tentative time limits to be allotted to the various stages of the planning process. They decide how the results of educational planning can best be organized in order to be of the greatest assistance to architects.

Decisions and plans made by the steering group or committee should be considered modifiable at any stage of planning. Such decisions and plans should be modified as unforeseen problems arise and as more usable procedures are proposed by members of planning committees.

Organization of Planning Committees

In order that local human resources may be utilized more fully in the planning process it is desirable to organize a series of planning committees. In addition to the general steering committee, a desirable pattern of committee organization usually includes a general committee for each division in the vertical organization of the school system (if more than one division is involved in the building program), and special committees under each general committee to deal with various aspects of the school program and the building facilities that are necessary for them.

Obviously, no single pattern of organization can be devised to fit every situation. Specific youth needs and the educational program planned to meet these

needs vary in practically every community. The numbers and abilities of local personnel available to assist in planning differ. Building needs are unique to a particular community, since they are influenced by population trends, conditions in the existing school plant, and other decidedly local factors. Consequently, a pattern of committee organization which can operate successfully in view of these factors must be devised for a particular building program.

The selection and appointment of committee members is a job for the school administrator and his general committee. This group should, of course, encourage and make use of suggestions from other appropriate individuals and groups. Prior to actual selection and assignment to a particular committee, the steering group should establish criteria for their own guidance. Such criteria undoubtedly should include the following:

1. An effort should be made to utilize as many members of the school staff as possible, and at the same time to keep the membership of each committee of a workable size.
2. Members of committees should possess knowledge that can contribute to the solution of problems being attacked.
3. Members of committees should possess some interest in the problems under consideration.
4. Some members of each committee should have demonstrated a disposition and ability to work cooperatively in a group as well as a personal drive to achieve results.
5. Adults in the community should be asked to participate in committee work to which their interests and abilities can make effective contributions.
6. Pupils should be asked to participate in the work of committees if they can make effective contributions and at the same time gain educational value.
7. The superintendent of schools and educational consultants that may be employed should be considered ex officio members of each committee.

Although the general steering committee must determine committee functions in terms of local conditions, the general functions of all committees might be stated as follows:

1. Evaluate the existing philosophy and program of education.
2. Recommend changes in and interpret the existing philosophy and program of education.
3. Prepare a statement of educational and building requirements for each aspect of the school program that is involved in the proposed building program.
4. Assist in the preparation of educational specifications for school buildings.
5. Assist in the evaluation of building plans and specifications.
6. Assist in determining essential design characteristics of special building features.
7. Assist in the preparation of equipment layouts and equipment specifications.
8. Assist in the evaluation of completed buildings.

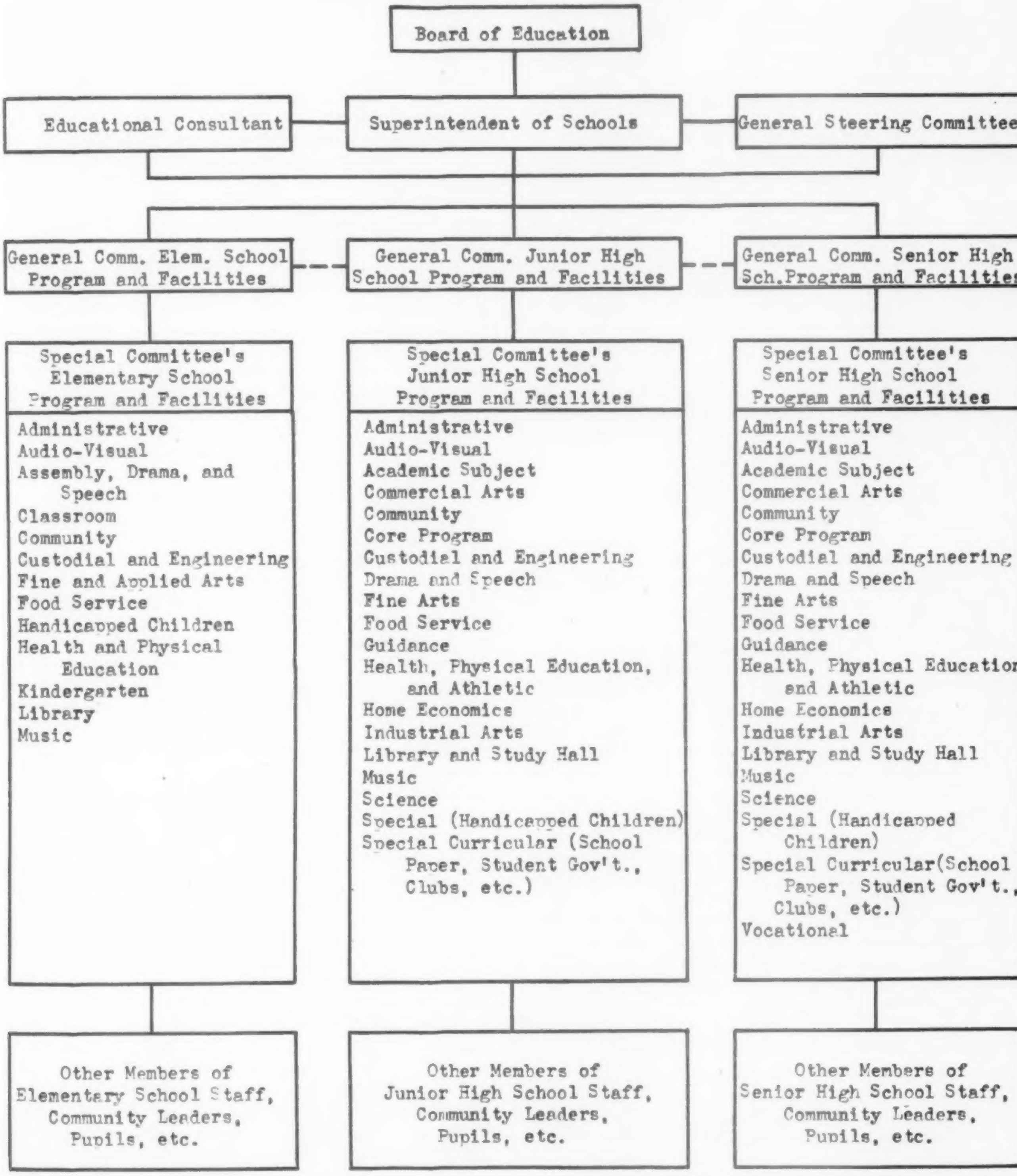
More specifically, the general steering committee, in addition to doing the initial planning for the total undertaking, takes the responsibility for evaluating and preparing a statement of the general philosophy of education as well as specific interpretations of it that can assist in determining general policies and practices to be followed in the program of education. This committee is a "spark plug" for the whole venture and stimulates and assists other committees at every opportunity. It sees that necessary information other than that to be gathered by the various committees is available and organized. It assists consultants in analyzing committee reports and other information for significant implications related to school building facilities. The general steering committee helps in the preparation of final educational specifications for specific buildings. It assists the administrator and consultants in evaluating plans and specifications and in keeping staff members and others informed of what is being done. It participates in the formulation and application of procedures for evaluating completed buildings in terms of educational criteria.

The general committee for each vertical division of the school system interprets the philosophy of education agreed upon and determines policies and practices that are applicable to the division for which it is responsible. It assists special committees under its direction and coordinates their work. It assembles and coordinates the reports of these committees. It assists the steering committee and consultants in analyzing data and preparing educational specifications for buildings. It assists in evaluating plans and specifications.

One of the major responsibilities of each general committee, assisted by consultants and the central administrative staff, is that of assembling and organizing information other than that to be gathered by various special committees. Such information includes:

1. Enrollment data such as enrollment estimates by grades and by buildings, current and past enrollments in special and elective courses and activities, and anticipated trends in enrollments and activities.
2. Data concerning the organization of the school program such as the current course of study by grades indicating prescribed and elective courses, as well as time allotments, current class schedules for individual buildings, lists of activities other than courses, and statements of anticipated changes in the organization of the school program.
3. Administrative policies such as time divisions in the school day, teacher activities other than instruction, desirable pupil-teacher ratios, desirable teacher loads, provisions for handicapped children, and desirable provisions for handling pupil wraps and books.
4. Desirable maximum capacities for special facilities such as the lunchroom, gymnasium-seating, the auditorium, outdoor-play areas, stadiums, and the like.

Special committees, under each general committee, prepare statements concerning the functions of each aspect of the program. They evaluate each aspect of the program and formulate statements setting forth in detail the desirable characteristics of it. They formulate statements concerning desirable building



features to implement the program. They also indicate building characteristics that are known to be undesirable as a result of experience with them.

In order to assist the general steering committee in making an analysis of committee reports, such reports should be organized in terms of a common outline. A typical outline for a special committee report might be as follows:

1. The specific functions of the area under consideration.
2. The specific nature and extent of the curricular program in the area (a detailed analysis of regular and related activities).
3. Administrative and organizational policies that affect the program in the area.
4. Desirable building facilities for implementing the program in the area.
5. Undesirable building facilities.

In addition to performing the preceding functions, special committees ordinarily assist in evaluating

those aspects of plans and specifications with which they are particularly concerned. Certain committees prepare equipment layouts and equipment specifications for the areas with which they are dealing. All committees assist in evaluating completed buildings in terms of educational criteria.

Although the major responsibilities for educational planning rest with the committees indicated, pupils, adults in the community, and school staff members not serving on committees can make effective contributions. The knowledges and talents of these groups should not be overlooked. Pupils often can assist in gathering valuable information; for example, in one instance social study classes undertook a pre-school census to provide data for making enrollment estimates. In addition, pupils can make worthwhile suggestions concerning building features. Adults in the community can assist in the planning of educational and other facilities that are used frequently by the community-at-large. They can also help to coordinate community planning and school building planning. It scarcely needs to be said that all members of the school staff have something to offer. They are engaged in making the day-to-day school program function.

Formulation of Building Requirements

As soon as committee reports and other data are organized, they must be carefully analyzed and applied in determining the educational requirements for specific buildings. The responsibilities for such an analysis and application may be assumed by various individuals and groups, depending on the local situation. If educational consultants have been employed, they may make the analysis and prepare educational specifications for each building involved in the building program, utilizing the services of various committees as the need arises. In other cases, the general steering committee, under the direction of the school administrator, may perform this function. In small school systems, the administrator and his entire school staff may undertake the job, with advice from consultants at strategic points in the work.

Ordinarily, the first task is to make a complete analysis of committee reports and of such other information as may assist in defining the character of the school program and in determining qualitative building needs. The outcome of this analysis should be an outline report for each division of the school system containing basic statements that define:

1. The functions and character of the school program.
2. Specific functions served and activities carried on in each of the various curricular, administrative, and operational areas.
3. Kinds of rooms and areas needed.
4. Desirable characteristics of rooms and areas and general building features.
5. Undesirable characteristics of rooms and areas and general building features.

These reports provide the basic information for preparing qualitative specifications for each type of building involved in the program.

In order to formulate quantitative requirements for particular buildings, it is necessary to calculate or otherwise determine the numbers and sizes of each type of room and space needed. For an elementary school building, the determination of the number of regular classroom needs is a relatively simple matter. Assuming that enrollment estimates are available for the district served by a specific building and a desirable pupil-teacher ratio has been decided upon, the required number of classrooms is obtained by dividing the average estimated enrollment for a predetermined period by the average pupil-teacher ratio. It should be noted that an average and not a peak estimated enrollment is used. If planning has been carefully done, it is possible to take care of peak enrollments by slight crowding of pupils, whereas, it is difficult to justify large amounts of excess space during periods when enrollments are declining. In the writers' opinion, enrollment estimates for local school districts should cover a future period of approximately fifteen years and they should continuously be checked and revised as new data become available. The making of estimates for a small geographical area covering a much longer period than this is highly questionable practice.

In many modern elementary school buildings, special rooms are provided for handicapped children, music instruction, fine- and practical-arts instruction, physical education, and the like. Probably no single procedure can be devised for determining the number of such rooms needed in every situation. In many cases, however, certain formulas used in determining room requirements for secondary school buildings can be simplified for use in determining elementary school needs. Anderson's Formula, for example, can be made suitable for such use by simply eliminating the factor for schedule making.[1]

The formula would then be:

$$\text{Number of Rooms} = \frac{\text{pupil-periods per week in a subject}}{\text{average size of class} \times \text{number of periods per week}}$$

or

$$\text{Number of Rooms} = \frac{\text{pupil-minutes per week in a subject}}{\text{average size of class} \times \text{number of minutes per week}}$$

When some such procedure as this is followed, it obviously is necessary to calculate requirements for each type of room separately. If more than one room is indicated for physical education it is the usual practice to provide one gymnasium, and to increase its size above that agreed upon as desirable for serving a single class group at one time so that two or more groups may use it at the same time. A similar procedure may be followed for fine- and practical-arts rooms to save duplicating equipment.

Numbers of administrative rooms and general service rooms (such as the lunchroom) cannot be calculated by mathematical methods. Quantitative requirements for these rooms must be determined in view of established policies concerning the program, necessary equipment, and numbers of persons that are to use them.

Approximate necessary floor areas for elementary school rooms can be determined by multiplying the

[1] Homer W. Anderson, *A Method for Determining the Housing Requirements of Junior-High-School Programs*, University of Iowa, Studies in Education, Vol. 3, No. 8, 1926, p. 22.

appropriate space allowance per pupil by the average class or group size which is to use a particular room. Satisfactory per-pupil space allowances for elementary school facilities can be found in recent publications such as: *Space for Teaching*, published by the Texas Experiment Station, A. and M. College, College Station, Texas; *School Building Code*, published by the Connecticut State Department of Education, Hartford, Connecticut; *A Guide for Planning Elementary School Buildings*, available from The Bureau of Educational Research, The Ohio State University; and *A Guide for Planning a School Plant*, published by the National Council on Schoolhouse Construction. It must be remembered that adequate space allowances per pupil depend upon the character of the educational program. It is often wise, therefore, to check approximate floor areas determined in the preceding manner by making rough room and equipment layouts to an appropriate scale.

The determination of quantitative room and space requirements for secondary school buildings usually is a more complicated process than the determination of such requirements for elementary school buildings. Probably the most accurate method is that of making a detailed schedule of courses, activities, and rooms, as presented by the Committee on Schoolhouse planning of the National Education Association.[2] In attempting to shorten the procedure, numerous formulas have been devised by such men as Anderson,[3] Sheffield,[4] Packer,[5] and Wilson.[6] In addition to presenting a formula for calculating room and space requirements, Wilson's study indicates a technique for determining proportionate numbers of various sized interchangeable classrooms.

The writers prefer to use Anderson's method of calculation, as it provides room requirements in some detail and is adaptable to most situations. Since methods of using the various formulas are discussed in the publication indicated, there is little need for discussing them here, except to say that accurate results depend upon intelligent application in terms of local conditions.

The numbers of administrative rooms and of certain general-service rooms (auditoriums, lunchrooms, etc.) cannot be calculated mathematically. Such requirements must be determined in view of the uses to be made of them, necessary equipment and the number of persons that are to use them. Ordinarily the major variations with respect to general-service rooms deal with their size rather than with their number.

As indicated for elementary school buildings, approximate necessary floor areas for various rooms can be determined by multiplying appropriate per-pupil space allowances by the number of pupils in an average-size class. The majority of publications which were listed earlier as containing pupil requirements for elementary school facilities also contain data for secondary school facilities. Again, it is necessary to point out that adequate per-pupil space allowances can only be determined in terms of the character of the educational program. For secondary school buildings it is important to make tentative room and equipment layouts in order to check approximate floor areas determined by calculations. This is particularly true with respect to special areas such as industrial arts, home economics, and science.

Preparation of Educational Specifications

The organized information, available after procedures already discussed have been completed, can be used in preparing tentative educational specifications for the various buildings to be erected, added to, or remodeled. The writers have found it desirable to prepare such specifications in the forms of: (1) A program of requirements for each building to be erected, added to, or remodeled; and (2) A guide for planning each type of building involved in the building program. The first of these items is primarily concerned with quantitative requirements and frequently is organized in terms of the following outline.

1. General design requirements
2. The general nature and function of the building
3. The building site
4. Significant community characteristics
5. The building capacity
6. Facilities required (organized in tabular form showing various types of rooms and facilities, references to qualitative requirements of rooms or facilities in the guide, the number of each type of room or facility to be provided, approximate size of each room, and remarks dealing with special requirements for each room or facility)
7. Community use of building facilities
8. Cost of the project

When remodeling of existing facilities is involved, an additional section should be added indicating required remodeling of the existing building.

The second item deals primarily with qualitative requirements for each type of building (elementary school, junior high school, senior high school, vocational school, etc.). The outline for the major part of *A Guide for Planning Elementary School Buildings*, prepared by the writer and others, is included here to show kinds of topics that need to be covered.

1. Development of the site
   (Placement of the building, outdoor activity areas, circulation and service areas, planted areas, service facilities and drainage)
2. General characteristics of the building
   (Architectural character and general layout, economy of plan and construction, economy of operation and maintenance, height of building, interior flexibility, expansibility, circulation, ingress and egress, provisions for community use, visual conditions, auditory conditions, thermal and atmospheric conditions, sanitary conditions, safety conditions)
3. Interior spaces and rooms
   (Corridors, stairways and ramps, lobbies, elevators, kindergarten rooms, classrooms, special classrooms for handicapped children, special activity classrooms, auditorium, gymnasium and auxiliary rooms, combination gymnasium-audi-

[2] Frank Irving Cooper, Chairman, *A Report of Committee on Schoolhouse Planning of the National Education Association*, Washington, D. C.: The Association, 1925, pp. 27-31.

[3] Homer W. Anderson: *op. cit.*

[4] H. Monroe Sheffield, *Class Sizes and Their Relation to School-Building Planning in High Schools of More than Two Hundred Enrollment*, Unpublished Master's Thesis, New York State College for Teachers, Albany, New York, 1938, p. 29.

[5] P. C. Packer, *Housing of High School Programs*, Contribution to Education No. 159, Teachers College, Columbia University, 1924.

[6] William K. Wilson, *Classrooms, Time Saver Standards*, New York: F. W. Dodge Corporation, 1946, p. 343.

torium, libraries, lunchrooms and auxiliaries, combination lunch-assembly rooms, administrative offices and auxiliaries, clinics, teachers' rest rooms, pupil toilet rooms, public toilet rooms, custodians' and service-system rooms)

4. Building details
(Interior wall surfaces, partitions, ceilings, finished floors, windows, screens, interior doors, interior trim, wardrobes, chalkboards, bulletin boards, cupboards and closets, display cases, shades and blinds, interior painting and decorating)
5. Service systems and equipment
(Electrical, heating and ventilating, plumbing and drainage)

The topics covered in such a guide should be developed from the point of view of establishing desirable objectives for the architect to achieve rather than from the point of view of specifying particular materials, plan and room arrangements, building features, and service systems. In other words, this document should present the conditions that are essential to implementing a desirable program of education. It should in no way limit the creative ability of the architect.

After the tentative educational specifications are completed, a rough cost estimate should be prepared for each building, assuming that it is designed in terms of the established specifications. The services of an architect or of a school building consultant who is familiar with school building design and building costs are necessary in making such estimates. If estimated costs of all projects exceeds the amount of money available or obtainable, established educational specifications may have to be modified or changes in the total program to be undertaken may have to be made. What can be done, of course, depends upon conditions in the local community.

As soon as such adjustments as are necessary have been made in the tentative specifications, final drafts can be prepared. These should retain the form indicated for tentative drafts.

In addition to the items already indicated, it frequently is necessary to prepare suggested sketch designs for special features, an outline of equipment specifications, and detailed equipment and service outlet layouts for certain special facilities. The last item named should not be prepared until the architect has definitely established basic spaces to be allotted to the various curricular areas.

Evaluation of Plans and Specifications

The administrator, the general steering committee, and such consultants as may be employed need to work with architects during the development of tentative sketch plans in order to help them interpret educational specifications. An architect, working on the plans for an individual building, normally develops a number of schemes in order to study exhaustively, possible solutions to the problems of design. All schemes need to be carefully checked for conformity with educational specifications by the educators mentioned. As soon as a basic scheme has been agreed upon and approved by the local board of education, local planning committees other than the steering committee normally are asked to check those parts of plans with which they are particularly concerned. During the detailed development of basic plans and outline specifications, consultants and local personnel confer with the architect as the need arises. When everyone involved is satisfied that basic plans incorporate all the predetermined educational specifications insofar as possible, and these plans are approved by the board of education, the architect usually is instructed to proceed with working drawings. When working drawings and specifications are completed, a final check for conformity with educational specifications should be made by consultants, the administrator, and the general steering committee.

Evaluation of Completed Buildings

No planning is complete without some attempt to judge the accuracy of conclusions reached during earlier stages of the planning process. Consultants and local personnel, therefore, need to evaluate buildings after they are in use in terms of their suitability for implementing a desirable educational program. Instruments must be developed by the various groups participating in building planning to assist in this task. The kind of evaluation needed is not the kind that is carried out with the usual building "score card." Rather, instruments and techniques are needed which can provide at least some of the answers as to how and to what extent building features and conditions are influencing child development and are helping to meet other community needs. There are unlimited opportunities for extensive experimentation and creative work in this field.

Cooledge, Shepley, Bulfinch and Abbott, Architects

The Lamont Library now being erected in Harvard Yard—a fine example of contemporary design being brought into harmony with older buildings by use of prevailing red brick and limestone trim.

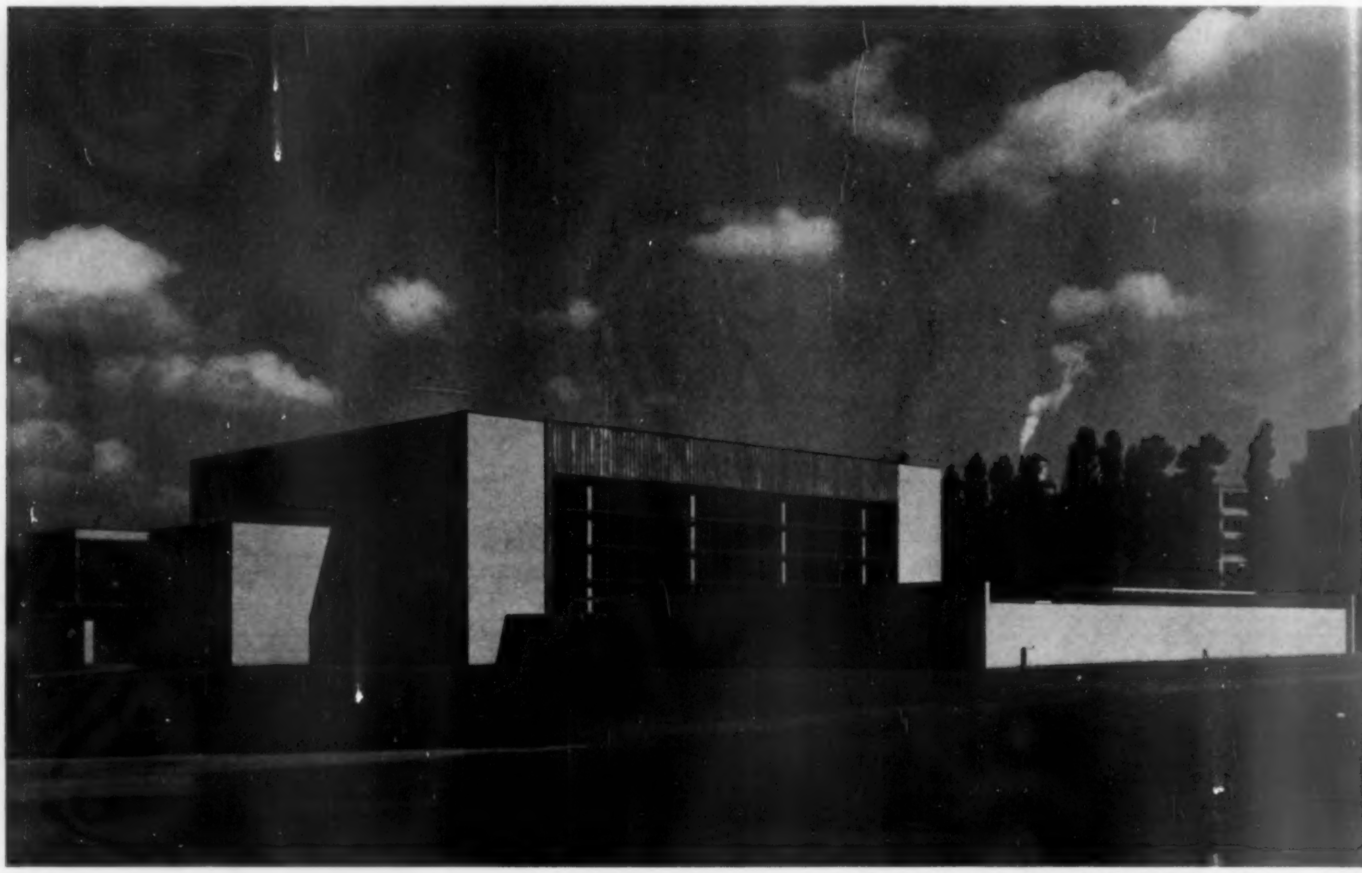
COLLEGE ARCHITECTURE IN TRANSITION

By LORIMER RICH, Architect

The architect of the Tomb of the Unknown Soldier, Lorimer Rich has planned many federal and school buildings. Pratt Institute in Brooklyn, Long Island College, buildings at Syracuse University and at State Teachers College, Oswego, New York, are among his commissions. He was graduated from Syracuse University and received an honorary Doctor of Fine Arts from that institution. Mr. Rich has had his own architectural practice since 1930. He is a member of the American Institute of Architects.

New Dining Hall and dormitory additions at Syracuse University. Harmony is achieved here by use of similar red brick and limestone trim and great simplicity of forms.

Harry A. and F. Curtis King, Associate Architects



Lawrence B. Anderson and Herbert L. Beckwith, Architects

Exterior of swimming pool building at Massachusetts Institute of Technology. Its simple composition and light-colored brick cause it to blend in very well with classic buildings of limestone.

TODAY colleges and universities are constructing many new buildings. Their executives and boards of trustees are engaged in plans for future development and expansion. Some of these people are faced with differences of opinion in regard to the architectural style of the new work. Shall it follow the Gothic, Colonial or Victorian precedent of the present buildings, or shall it embrace the new expressions of architecture which are meeting with so much approval throughout the industrial and commercial world? I should like here to set down some of the reasons why it seems advisable that the new work should follow the modern trend.

It is said that our social and economic distress is caused by the fact that our social system has not kept pace with our technical development. Our architectural confusion also undoubtedly stems from the fact that our architecture has not kept pace with our technological advances.

The general controversy in regard to architecture of course at once reaches into the domain of college architecture. On the campuses of many colleges we naturally find the perfect setting for this battle of the styles. We have the old traditional buildings that are there; we have the need for new buildings; we have, in many instances, a school of architecture established on the campus with its forward-looking enthusiasm for contemporary forms. Above all we have at every turn youth and optimism stimulated by the tremendous technical facility of this generation and the feeling that we are at the beginning of a new age dominated by the machine and dedicated to an economy where materials are cheap and labor is expensive.

The Old and the New

In the enlargement and development of our American colleges and universities we are faced in most instances with an alteration job. Seldom does it come to a board of trustees or to an architect to lay out a whole university from scratch. Seldom does the designer find a situation where he is not required to struggle with existing buildings, and style and materials which are not to his taste, and locations which are not of his choice.

The great majority of our colleges and universities built many of their buildings between 1850 and through the first quarter of this century. These 75 years of growth included some periods of low architectural achievement. The result is that most of our campuses are defaced with some examples of questionable architectural taste. These creations in many cases occupy important locations. They are substantially built. Many are reasonably efficient and be-

cause of sentiment and economy they must be preserved. Therefore, their acceptance and integration into new campus plans and compositions becomes a matter of importance.

The concern of the architects, the trustees, the administration and the students is that the new buildings be efficient, have pleasant interiors and exteriors, and that a maximum degree of harmony be created between the old and the new. By harmony I mean a quality possessed by buildings which enables them to stand side by side without either offending or disturbing our visual senses. This does not mean that these buildings must all be of a style—Georgian, Colonial, Collegiate Gothic, Victorian or Spanish. It does mean that their color, their materials, their composition and their simplicity should be close enough in general conception to keep them in aesthetic tune with one another. Good examples of architecture, even though of various styles, can be harmonious and usually are.

Perhaps the greatest destruction of harmony is wrought by the use of several different building materials on one campus. One building made of red brick, the next building of limestone, the next building of yellow brick, and the next of terra cotta or brownstone, produce a restless and disturbing effect. Years ago when we did not have the easy transportation of distant building materials by means of railroad and trucks, we were generally confined to the use of local building products and consequently escaped the menace of chaotic materials. Harvard Yard has a pleasing feeling of rest and quiet which is greatly aided by the fact that in the majority of the buildings the material employed was a local red brick. Princeton derives much of its charm from the consistent use of a local ledge stone.

Traditional Exteriors

It is easy to understand why the college with, for instance, a Colonial or Collegiate Gothic building tradition, might wish to continue this style. Inquiry usually develops the fact that the objective is exterior harmony. Further pursuit of the subject generally brings out the fact that modern plans and modern techniques of functional efficiency are acceptable and even desired in the plan and in the interior of the building, but there seems to be a notion that if this contemporary thought is expressed on the exterior of the building that the result will not be pleasant in its relation to the other and older structures.

Contemporary planning lays great stress on efficient relationship of units. It requires that the various areas be in their best locations for use and it is reluctant to sacrifice function for exterior effect or monumental affectation. Modern planners are conscious of the increasing cost of space and know that architecture is not good unless it can defend its expense from all angles. The high cost of building requires thoughtful planning, and out of all this must

The interior of the swimming pool building is a vivid example of America's technological resources. The expansiveness of the glass wall could be produced only with our modern steel and glass.

come good buildings that answer today's problems and at the same time mingle on pleasing terms with the buildings of yesterday.

Obsolete Architecture

The vocabulary of traditional architecture, the small window, the pitched roof, the overhanging cornice, the column, the pilaster, the hand-carved ornament, all handsome in their time, are expensive, inefficient and meaningless nostalgia today.

The small window, three or four feet wide, was a necessity in colonial times because the width of the window was limited by the brick arch or the masonry lintel of that day. Today the steel column and the steel beam have infinitely increased the span of the window and have elongated it into a strip of glass, a modern idiom which is completely incompatible with the styles of yesterday.

Pitched roofs of shingle or slate were at one time the only method available of keeping water out of our structures and they became identified with our historic styles. Today flat roofs of tar, gravel, felt and adhesives are far more efficient and much less expensive. Industry, always quick to weigh the economic advantages of such things, has for years accepted flat roofs as the proper roof for the 20th Century.

Overhanging cornices, sometimes with expensive detail, were at one time a necessity in order to shoot the roof water far away from the building walls. Now with the flat roof, the cornice becomes useless as a functional unit and has been replaced by the parapet wall and the coping.

Columns and pilasters with their hand-carved flutes and capitals were a splendid outlet for the hand work and the craftsmanship of the artisan of other days when hand work was cheap and the machine was unknown. Today labor represents over 60 per cent of the cost of the building and it is scarce at that.

The rising cost of building has produced a forty-cent dollar. With the greatly decreased purchasing value of money colleges and institutions subsisting on fixed incomes are put to it to make ends meet. We can no more indulge in handmade buildings from such a limited budget than we can in handmade clothes or handmade automobiles. This is the age of the machine; whether we like it or not it is here and it controls our lives and our buildings. They are thus interwoven in our economy. Unless these clichés of the past, the small window and the pitched roof and the overhanging cornice, are abandoned, architecture cannot be expected to perform its historic function of reflecting the civilization it shelters.

New Building Materials

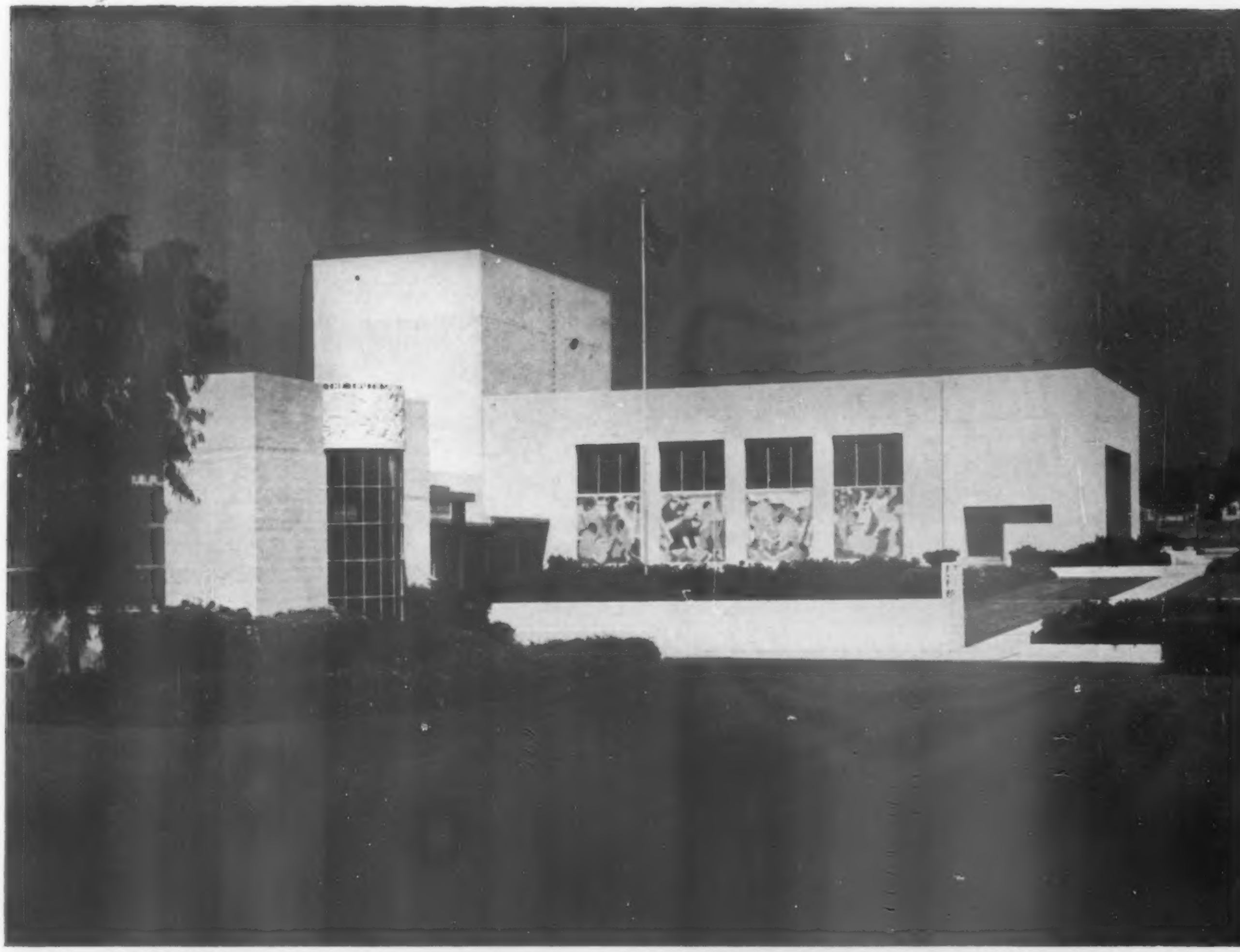
Our architecture, to be real, must reflect the times that produce it. The entire pallette of building materials of today is very different from that of a hundred years ago and it is most intriguing. Steel, glass, thermopane, radiant heat, electronics, fluorescent lighting, and plastics are some of the rich choice of materials from which we fabricate the buildings to house our fast-moving industrial age. These materials cannot reasonably be worked into traditional and derivative styles of architecture. Traditional styles are handmade architecture. Contemporary styles are machine-made architecture.

Most of us have grown to accept the modern idiom in relation to the high building. I presume this is because we have had the high building only since we have had the technical materials and facility to build it. In fact, it is rooted in and has sprung out of the steel mill and the glass factory and all of our enormous technological advances. It is the very expression of progress. We have been less willing to accept this tradition in lower buildings, that is buildings of two, three or four stories. Probably this is because high buildings were not attainable until our time and therefore their designers were unhampered by traditional prototypes whereas low buildings have always been with us.

Thoughtful analysis will show, however, that today's building, to be a part of today's life, and to be satisfactory to the demands of today's youth, must be approached from a contemporary point of view making full use of all of the richness of our production. It is difficult to picture General Motors doing a Georgian or Gothic factory today. Likewise, it is difficult to imagine a cyclotron being housed behind a Georgian façade.

Goals for Modern Architecture

Vital architecture always has expressed the times which create it. Gothic architecture sprung from the religious fervor of the day. Renaissance architecture is a product of the revival of learning, and our own contemporary American architecture will reach its full development only when it takes advantage of the mechanized economy in which we live. Derivative forms of architecture are no longer taught in the schools. Young architects no longer think in terms of doing buildings in the historic styles. A few of the older architects who were exposed in their impressionable years to the eclecticism of the past are fast disappearing. The new men coming into the profession will have nothing to do with these outmoded manifestations. The handwriting is on the wall. This growing organic movement is full of inspiration and promise. The younger men are determined that our architecture shall equal in achievement our automobiles, our mechanical refrigerators, our aeroplanes, our radio, and our nuclear products. This feeling permeates our campuses and is nourished by the life of the laboratory and the classroom. It cannot be stopped. It is setting a new standard of architecture and is supplying us with a new yardstick on which the marks are utility, strength and beauty.



A simple design, easy to maintain, is preferred to an over-ambitious planting which is allowed to grow shabby.

LANDSCAPE ARCHITECTURE FOR SCHOOLS

By PRENTISS FRENCH

Landscape Architect, San Francisco

During the war Mr. French was senior landscape architect with the Planning Branch of the Office of the Chief of Engineers, U. S. Army. Engaged originally to act in matters of planting in connection with the camouflage program, he later worked with the Army Air Forces on layout of Army airfields. Among the projects he has planned in private practice are estates, school grounds, and the landscaping for a number of government housing projects. His present office is in San Francisco, California.

THE landscape architect is especially conscious of many important school plant problems that are much too frequently relegated to second place, postponed, or entirely forgotten in the planning stage. By training and experience the qualified landscape architect, working in collaboration with the architect, is in a position to give these problems the attention they deserve and to make a real contribution to coordinated planning.

Why is it that matters related to the development

of grounds are so often not planned in advance when this may mean great opportunities lost or situations created that are impossible of correction? The answer appears to lie in the fact that the buildings alone represent an enormous planning problem. The intricacy of this single problem, plus the fact that the cost of buildings is the major consideration and that in any event the finishing of the grounds must await completion of the buildings, often prevents detailed and complete layout from being designed in advance; and yet lack of such planning may mean that opportunity for the best development is irrevocably lost. It also means that complete costs for the entire work cannot be determined. In this connection it may be of interest to note that such experienced agencies as the Office of the Chief of Engineers, United States Army, in its Veterans Hospital program and the U. S. Housing Authority in low-rent housing have required that complete planning, even detailed planting plans, be done in advance and contracts let on the complete work.

The experienced landscape architect has much to contribute in the following phases of school planning: (1) site selection, (2) site planning and (3) planning details of out-of-door elements, including not only planting but such elements as grading, walls, fences and steps.

Site Selection

Normally the landscape architect would not be the one to determine whether a school is needed in a given locality. True, some practitioners experienced in city planning techniques could be of genuine assistance in this determination, but for present purposes it is assumed that others will establish the necessity of a school of a certain kind and size within a given locality. What service, then, can the landscape architect render after this determination has been made and a specific site must be chosen? His experience with ground forms probably comes first, ground forms in relation to the uses to which they may readily be adapted. Too frequently a site is thought by the untrained to be nearly level, whereas after it is acquired it turns out to be very far from level. As a result, easy relationship of floor levels to exterior ground is not feasible and grading an athletic field involves enormous expense; or, on the other hand, the site may be so flat and low-lying that drainage and the importation of fill become items far out of proportion to other costs. There may even be a choice between a site with naturally good soil, where presentable grounds can be created and maintained at low cost, as against another where quite the reverse is true.

Matters other than those mentioned above are, of course, of great importance: existence on or near the site of utilities (water, sewer, electricity, gas); acceptable sub-soil foundation conditions; and proximity to good roads and transportation. As a rule these factors are likely to receive adequate consideration.

As the final step before commitment to purchase a school site, the making of a rough sketch layout plan based on such map information as may be available is well worthwhile. Again there is the need for close cooperation between architect and landscape architect. If such a sketch showing buildings of approximate size, game and other outdoor areas, approaches, service, and all other important elements including schematic system for drainage proves that just one satisfactory layout can be evolved, then assurance is given that use of the site is feasible. If no good layout can be evolved because of difficulties such as rough topography, abnormal shape of property, or unfavorable relationship to approaches, then the site has been demonstrated to be unsuitable.

Site Planning

In landscape architecture the relationships of objects in space are of the utmost concern, space measured not only horizontally but vertically. Some of these relationships, all at the very heart of school ground design, are: relationships making for ease of circulation, such as proper, close coordination of related functions; differences in grades held to a minimum between, say, an indoor classroom and an out-of-door space; sufficient compactness of buildings and grouping of buildings to provide for efficient operation and yet maintain good light and air; and a degree of compactness in the grouping of buildings and service elements, which, while allowing for possible future expansion of buildings, gives recognition to the fact that adequate areas of land usable for out-of-door activities must be left unencumbered.

It should be recognized from the start that a good site plan is fundamental to a good final result and that conversely, no matter how fine the buildings, how green the lawns, or how handsome the plantings, there can be no notably fine result based on an ill-conceived layout. True, a poor plan may be partly concealed by such expedients as planting, but a bad situation can almost never be converted into a good one by any means within the range of attainment.

What constitutes a site plan and what makes it good? The first can be answered definitely, the second less specifically.

A site plan is a map representation based on a topographic survey, drawn to scale and showing all of the important features of the proposed school layout. It may well be supplemented for greater clarity by perspective sketches, possibly including a bird's-eye view, or by sections to show graphically various differences in grades. Proposed grades should certainly be shown if only by spot elevations at the most significant points.

A good site plan can be described only in general terms. It is one well adapted to the site in question, showing due consideration for problems of access from without and for the topography of the site itself, and indicating a development within which have been achieved (1) a functional interrelation of elements for most efficient and convenient use, (2) economy of space for such elements as drives and service yards not directly usable for educational purposes, (3) economy in money cost by minimizing grading, drives, retaining walls, and other similar items not an object in themselves, and (4) the opportunity for a presentable appearance of the whole.

Very frequently large projects are not completed in one stage, but are gradually completed over a period of years. A good site plan, or more properly in this case, a master plan to govern the whole ultimate development is extremely important. Under these circumstances and since future conditions can never be foreseen with entire assurance, the site plan must

provide a reasonable degree of flexibility. One of the best means for giving flexibility is to plan the various basic elements, such as facilities for service, athletics, and different phases of education, as compactly as is functionally good, leaving adequate separation of open space between these basic elements. In this way flexibility and the opportunity for expansion will be provided.

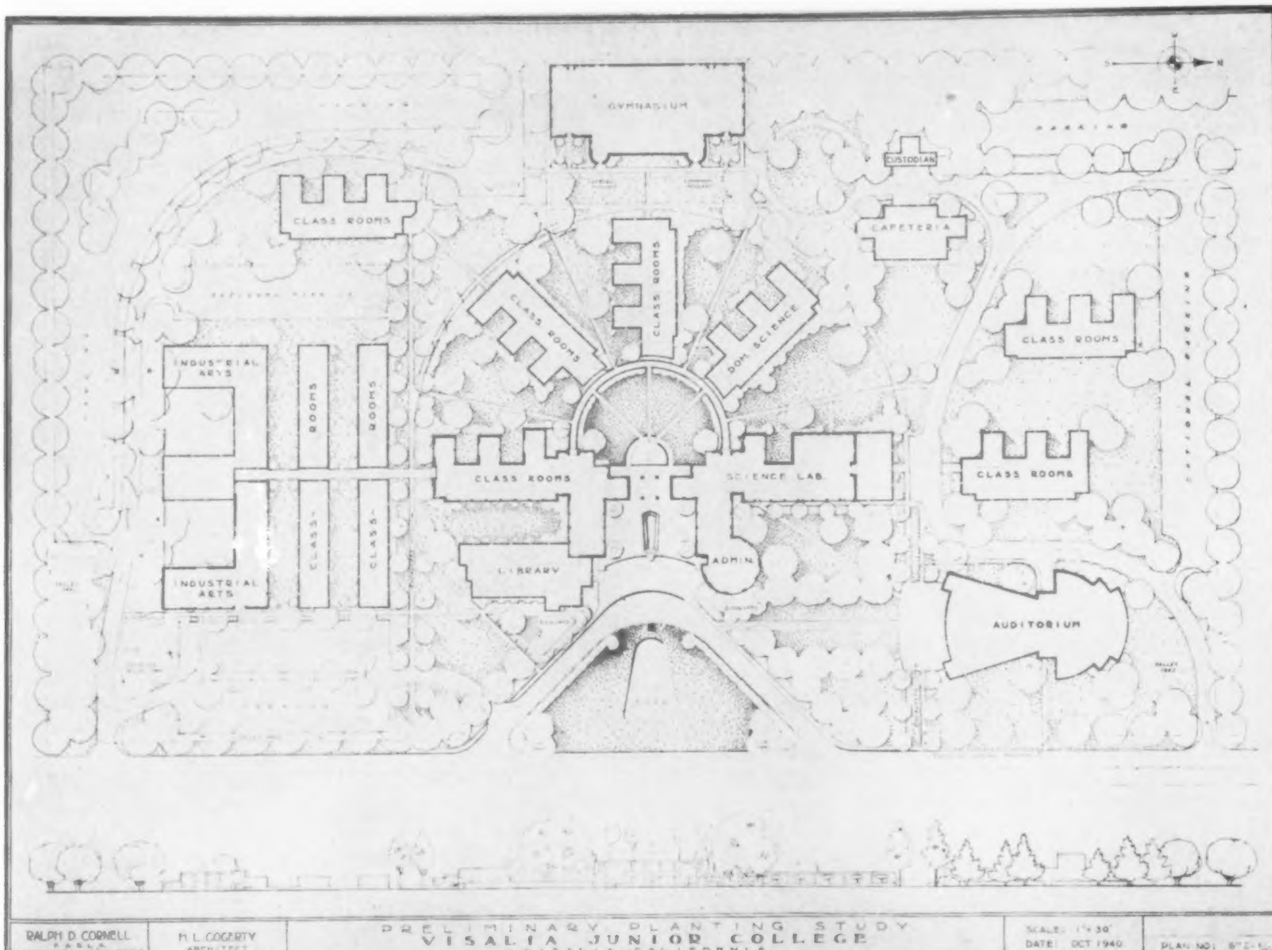
When Grading Is Necessary

The moving of earth from one place to another is obviously nothing to be sought for its own sake. In case a site well-adapted topographically can be found in the locality where a school is needed, grading operations with attendant added cost will be at a minimum. If a site is topographically not so suitable, there may be no alternative to heavy grading. On the other hand careful study by an experienced man may often reveal the possibility of a fine result at minimum expense. This sort of problem, involving the use of the contour grading plan technique and other special expedients, is one which those experienced in landscape architecture are especially well equipped to solve.

Although grading for grading's sake is no objective, it is nonetheless true from every standpoint that it should be properly done by an experienced professional. Take the matter of drainage, so important on school grounds where quick drying off is so desirable. How many know that for adequate runoff on grass areas the slope must be in the neighborhood of 2 per cent? Furthermore, the effect of grading on appearance may be subtle, making or ruining a composition. For instance, a wide flat area adjacent to a building approached by an up-hill walk may cut off the whole base of the building; and however handsome the building may be, it is never properly seen.

The argument may be advanced that the cost of grading, because of the present availability of heavy, specialized equipment, is now relatively cheap. This is true, but other costly items, often not thought of by the inexperienced, attend heavy grading operations —such as stripping, stockpiling and replacing topsoil, compaction of fills, prevention of erosion on steep banks, construction of retaining walls, and dust control. Some grading is unavoidable, but heavy grading at great cost may often be avoided by careful planning.

A few special points in regard to grades and grading may be worth noting. Close grade relationship between associated elements is extremely desirable, as, for instance, between the floor of a kindergarten room and the adjoining out-of-door instruction area; or between entrance walk and buildings. Long flights of steps are disadvantageous, creating something of a hazard, impeding rapid movement, and giving an un-



due sense of separation of the indoors and the out-of-doors.

Topsoil should ordinarily be stripped and stock-piled as the first step in grading operations. Even here considerable judgment must be exercised. Perhaps the topsoil is not of good quality and of no great value; or the school grounds are to be paved to such an extent that relatively little topsoil for lawn and other planting will be needed. Possibly it will be advantageous to strip only areas where cut is to take place. These are matters to be determined for each individual site, matters the landscape architect is well qualified to solve correctly on the basis of his experience in grading and horticulture.

Quantities of cut and fill should, if possible, be balanced to avoid the expense of importing earth or hauling it away. The intricate and laborious processes necessary to work out a plan which balances cut and fill are all too frequently neglected. For most types of soils, where cut material is used for fills which are heavily compacted by such modern machinery as the sheeps-foot roller, the cubic yards of cut will fall short of the fill created, in some cases by fully 30 per cent. This must be taken into account.

In extensive projects with lower-type buildings consideration may well be given to the economy made possible by using modern methods of soil compaction, developed originally by the builders of highways and extensively used since for airfield construction. Standard practice for years has been to carry building foundations down below the surface of the original ground; but, as an example, the Army Engineers have secured entirely satisfactory results by constructing foundations on properly compacted fill. Such work must be most carefully controlled, but economies can be great for large projects.

Construction Features on the Ground

Two classes of elements appear on the school grounds—those that are useful in themselves, such as out-of-door classrooms and recreation areas, and those better classified as service features, such as walks, drives, and service areas proper. These latter are built only to make possible the functioning of the whole school unit and do not contribute directly to education or enhance beauty. They should therefore be held to the minimum consistent with function. The landscape architect may well contribute in the design of both classes of elements. A few points may be worth making.

Drives should be as direct and as narrow as is functionally good. They are expensive in money and space, and they may create an actual hazard if improperly located. Usually at least one is necessary, however, to reach the service portion. Encircling the main school building with a drive is by all means to be avoided, since thus a barrier, an actual hazard, is formed between indoor and out-of-door activities.

With such a minimum of drives as suggested, one may very appropriately ask how the necessary functions of moving furniture and supplies and the passage of fire apparatus are to be provided for. The answer lies in planning wide walks, dual purpose walks, serviceable for pedestrians and occasional motor vehicles. This is entirely feasible in most cases since main school walks must be wide in any event to accommodate the heavy intermittent traffic, and the only added expense should be in securing curves suitable for vehicular use and sufficient strength of pavement for added load.

Consideration may well be given to the elimination in school work of all outside steps whenever feasible. Steps tend to retard movement, they are costly, and in many cases can very readily be replaced by ramps. It must be borne in mind, however, that in freezing climates the slope of a ramp may be dangerous.

The design of outside steps would appear from observation to be a subject too little understood outside the profession of landscape architecture. It is logical that steps within buildings should generally be rather steep, with high riser and narrow tread. The reason is that to design them otherwise would take a great deal of very costly building space. Since no such impelling economic restrictions limit the design of out-of-door steps, they should be built in more ample manner with lower risers and longer treads. A rise of six inches and tread of fifteen represent good relationship.

Where there are differences in grades to be overcome, the use of retaining walls in place of steep banks should be considered thoroughly. Retaining walls involve heavy initial expense, but steep banks have serious drawbacks. They are not usable for any school purpose, they occupy much space, and in most areas they are costly to maintain. In many cases a properly designed retaining wall may be the economical solution in the long run.

Planting But One Phase

The important finishing phase in the development of school grounds is planting. All too commonly landscape architecture is understood to include only planting, a misconception dispelled, it is hoped, in the minds of those who have read to this point. The many facets of landscape architecture are often obscured by the over-simplification implied by the use of words like "landscaping" and "beautification," seeming to mean that after everything else is complete one can come in and by superficial application of planting make the result not only beautiful to look upon but functional as well. However rich the gown and furs, did anyone ever see a portly matron look as attractive as a tall, slim, well turned-out 20-year old? As with dress, planting can ameliorate the appearance of a bad framework, but it can never make it into a genuinely good one.

Planting is but one element of the whole. It should receive consideration from the inception of the school project, from the soil standpoint even in the site selection stage, and in the grading design to allow for the proper especially prepared soil. If it is not considered it will no more fit into the picture to the best advantage than desks will into an ill-conceived classroom.

As in any other matter of modern functional design, the problem of planting should be approached primarily from the standpoint of utility, not forgetting costs of the initial work or of maintenance. Such an approach with the layman is all too rare; he is inclined to regard planting as a mere ornamenting process. In fact, he may refer to it as "ornamental planting." Planting, however, does have very definite

uses. Can anyone say that planting firmly holding an eroding slope is not utilitarian, or that a heavy screen masking a cafeteria service yard is just ornamentation; or that there is no real use in a wind-break on a cold windy day, or in a spreading tree on a hot one, or in a densely interlaced prickly hedge to keep children from street traffic? By eliminating dust and mud, turf often justifies itself by greatly reducing floor maintenance. Planting may be useful also for actual instruction in nature study, botany and conservation. Yes, good looks are important, but good looks with only a little urging will spring automatically from good utilitarian design in planting just as in modern architecture. Little planting without justification in use should be required.

School plantings should consist of thoroughly reliable varieties that will withstand adverse conditions. School grounds are no place for horticultural experiment, unless it be in the trial grounds of an agricultural institution. It is wiser to follow the advice of an old Kew gardener who always, when confronted with a planting problem in a new locality, prowled about the oldest country cemetery noting what had succeeded well. "Here," he said, "You find a poor piece of ground. Everything anyone could think of has been planted at one time or another; and it has all been neglected." Such tried, almost iron-clad, plants are the ones to use, if not for all of the planting, at least for by far the greatest part. The professional landscape architect realizes acutely the difficulty of limiting himself in planting to a relatively short list of plants; and yet he knows that for a given locality there are only a few plants that are best and most reliable, and he knows that to multiply varieties will also tend to increase maintenance costs. Fortunately, he also knows that most of the finest effects are achieved both by Nature and by man by bold use of perhaps only one outstanding subject. Consider the coastal redwoods of California, redwoods in solid stand with a few under-growing ferns, or the cherry blossoms of Washington, D.C., standing alone on turf with water background. Collections of plants do have their place in arboretums, but except in cases where they may serve for actual instruction, they have no place in school ground development. Increased utility, lower maintenance and better visual effect will result from the use of a relatively few kinds of well-chosen plants.

Adequate soil preparation before planting is of the greatest importance. Without proper preparation plants are likely to present that stunted, wornout look all too common about schools; or else large expenditures for watering, fertilizing and other maintenance will be required.

Fairly large-sized plants should be set out initially, since small ones are much more subject to damage by children. Fragile plants, such as those that are brittle and easily broken, are to be avoided. For division purposes or to keep foot traffic within bounds, prickly plants such as barberry and firethorn are useful.

Seasonal characteristics of plants in relation to the school year should be considered. Will there be interest in spring? Will there be shade during heat, and yet sun in winter? Will the effect be cheerful and bright during the winter months because of evergreen shrubs and winter-berried plants? These and many similar questions are worth asking.

To conclude the subject of planting with words of caution may not be amiss. Over-planting of school grounds is definitely to be avoided. It is a frequent error, as frequent in some parts of the country as the lack of enough planting. One prominent school architect reports that wherever feasible he lays down a concrete strip four or five feet wide all around school buildings for the very purpose of preventing injudicious shrub plantings immediately against buildings. There are probably two reasons why over-planting is so common: the desire for immediate effect plus a lack of knowledge of the size of plants in maturity; and the fact that so much school planting is designed by those whose principal interest is the sale of a large quantity of plants rather than by the strictly professional practitioner of landscape architecture who has no interest in the sale of materials. Over-planting is costly at the start, occupies space otherwise useable for school purposes, may shut out light and air, is expensive to maintain, and creates an inferior visual effect. By all means avoid creation of plantations beyond the possibility of good maintenance. An extremely simple design neatly maintained is much to be preferred to an over-ambitious one of shabby appearance.

Another caution is against spotty planting, placing of plants singly or in minor groups within areas that ought to be simple lawn. Arrangements of this sort are generally bad visually and make mowing difficult.

Cooperation Necessary

Landscape architecture can make and has made a great contribution toward the development of schools, starting with site selection and running through site planning and grading to the design of planting. The greatest contribution is made when there is the highest degree of cooperation between the several professionals whose services are essential to a school development, the architect working with structural, mechanical, and civil engineers, and the landscape architect collaborating from the early stages. On large school work the responsibility of the architect with respect to the buildings proper is enormous, too great for him to concern himself intimately with all other phases. Only through genuine collaboration among qualified professionals can finest results in school planning be achieved.

PLAYGROUND SURFACING

By R. W. SHAFER

Business Manager, Board of Education, Cincinnati, Ohio

EVERY school district has at one time or another been faced with the problem of determining what may be the best treatment for its playgrounds. As we pass from school to school in the various cities, we are confronted with a variety of surfacings. Some are of a generally common type and others are peculiar to certain products in the local area that lend themselves to use for this purpose.

The question of playground surfacing has plagued many school business officials, and it is so intimately related to the physical education and recreation program that the experience of some school systems may be of interest and help to school officials who are looking for information of developments in this field of maintenance.

The Board of Education of Cincinnati, Ohio, has many kinds. We have grass, sand, clay, cinders, gravel, crushed stone, Portland cement concrete and bituminous surface treatments. During the war years we were compelled to use the "black-top" surfacing finish as it was available. This "black-top" surfacing is readily applied and serves quite adequately for a few years. It is, however, subject to frost and freezing, causing distintegration and necessitating repairs, and also requires a spray treatment every few years to reestablish the binder of tar or asphaltum. This binder, if neglected, induces a rapid disintegration and can require a complete resurfacing job if neglected in the program of maintenance.

In Cincinnati we decided to do some experimenting with emulsified asphalt as a stabilizer, and in the summers of 1940 and 1941 we put down six playgrounds.

Since 1940, when our first soil stabilized surface was laid down, we have been fully satisfied with the results obtained from this kind of playground improvement. It has shown but a few cracks which are readily repaired with a mix of asphaltum and sand, after spreading the cracks for penetration.

The present cost for this type of playground surfacing is naturally greater than it was in 1940 and 1941.

It is our definite intention in 1948 to embark on a large scale program of soil stabilization, since our experience has been so successful and has met with the unqualified approval of our school physical education and recreation staff.

Our procedure was first to secure representative samples of the materials to be stabilized and the local bank run gravel admixture, which were then shipped to the laboratory of the American Bitumuls Company at Baltimore, Maryland, in order to determine the grading of the materials. The soil, mostly heavy clay, and bank run gravel were blended in proportions of approximately 40 per cent, by weight, of the former and 60 per cent, by weight, of the latter in order to reduce the fines content of the natural soil, and thereby reduce the quantity of emulsified asphalt needed for stabilization. Absorption and stability tests were then made comparing treated and untreated samples in order to determine the optimum emulsion content for the sample which gave satisfactory resistance to water absorption and maximum stability. This figure was approximately 6 per cent, by weight, of stabilizer, based on total grading of aggregate. Our mixing proportions in the field for the 3″ stabilized base were all based on this laboratory analysis.

For the one inch top or leveling course the following mix was used:

120 lbs. HRM emulsion (undiluted)
295 lbs. #6 slag
470 lbs. concrete sand
65 lbs. agricultural lime
———
950 lbs. total batch

Enough water was added to obtain proper consistency.

For the wearing surface or seal coat the mix was as follows:

10 gal. HRM emulsion
15 gal. asbestos fibre (wet)
2 gal. agricultural lime
20 gal. plaster sand

Sufficient water was added to make a thin paste.

Sodium arsenite was used for a weed killer in a dilution of 1 gallon to 100 gallons of water. This was sprinkled over the soil before the 3" stabilized base was applied.

All operations except mixing and rolling were done by hand, by temporary unskilled labor. A 10 cu. yd. drum type mixer and a 2½ ton tandem roller were rented for each job. Concrete buggies were used in placing the batches from the mixer. Emulsion was purchased in tank cars, and stored for us by a private contractor who delivered it to the job in drums.

The total cost for this type of work, including 3" base, 1" leveling coarse and seal coat ran about 14½¢ per sq. ft. On one job where there existed an old penetration base of coarse stone we merely added the 1" leveling course and seal coat. This cost approximately 7¢ per sq. ft. When we again resume our program we are contemplating the omission of the one inch leveling course, which we believe will still result in a satisfactory job at somewhat over half the cost of our present construction.

One disadvantage of this type of work is the fact that the subgrade cannot be saturated with water, and that dry weather is required for a day or so after the mix is placed, as it is necessary that the treated material become dry enough for the force of absorption to surround the individual soil grains with a thin film of asphalt before the emulsified asphalt can become effective as a stabilizing agent.

The spots which were laid just previous to periods of rain now show considerable cracking, although the balance of the work is in very good condition. School principals and gym officials are well pleased with this type of surface. Our winter temperatures here seldom reach zero, although we do experience many rapid fluctuations between freezing and thawing weather, a combination which has a severe effect on most types of paving.

We have also found that a modified mix of the seal coat gives very good results on patching shallow disintegration or spalling of concrete driveways, and that a 1½" to 2" thickness of stabilized soil gives good results when used for lining drainage gutters or for treating slopes to prevent erosion.

Paved Play Areas for Cincinnati's Schools

1.0 GENERAL DESCRIPTION:

The work contemplated includes the construction of a base, leveling course, and surface course as hereinafter described. This specification does not include grading, retaining walls, fences, etc. These and other items not covered in this specification are shown on the plans and in special provisions. It is understood that grading shall have been completed and the subgrade thoroughly settled before the work under this specification is begun.

No work shall be performed when the temperature is under 40°F., nor when the humidity does not permit satisfactory results, as determined by the engineer. Construction shall be in location and to dimensions shown on the plans.

SECTION I STABILIZED BASE OF 3 inches minimum compacted thickness.

SECTION II LEVELING COURSE OF 1 inch minimum compacted thickness.

SECTION III WEARING SURFACE OF one of the following types:

Type A Bitumuls Asbestos filled surface ⅛" minimum compacted thickness.

Type B Cork filled surface ⅛" minimum compacted thickness.

Type A or B shall be used as called for on plans.

2.0 MATERIALS

2.1 *Base Aggregates.* Aggregates shall consist of soil, crusher-run stone, slag screenings or bank-run gravel of sound character, which may include fines from stripping and quarry seams, and shall always contain sufficient cementitious clay or rock dust to cement all particles into a dense, tightly bonded base after rolling and drying. Deficiencies in binder material or coarse aggregate shall be added in controlled quantities at the time of mixing.

At least 90 per cent of the aggregate shall pass a screen having circular openings of diameter not more than half the thickness of the base. At least 35 per cent, but not more than 80 per cent, shall pass a No. 10 sieve. At least 15 per cent, and not more than 30 per cent (when stone, slag, or gravel screenings only are specified, a minimum of 10 per cent of 200 mesh material shall be permitted), shall pass a No. 200 sieve when screened by the A.S.T.M. wet method.

2.2 *Leveling Course Aggregates*

Leveling course aggregate shall consist of sound crushed rock chips (½ inch to No. 10 mesh, not more than 5 per cent passing a No. 40 sieve); clean sand (100 per cent passing ¼ inch screen, not less than 85 per cent passing No. 10 sieve, not more than 3 per cent passing No. 200 sieve); and stone filler (80 per cent passing No. 200 mesh) having the following combined grading:

Sieve Size	*Per Cent Passing* *Min.*	*Ideal*	*Max.*
¾ inch	100	100	100
½ "	90	100	100
¼ "	60	75	85
#10	40	50	60
40	15	25	35
80	10	15	20
200 plus "Wash"	3	6	8

Not less than 5 per cent of the mix shall be stone dust passing a No. 200 sieve obtained by adding stone dust filler to the mix.

2.3 *Ground Cork*

Ground cork shall be free from all dust and deleterious matter and shall meet the following graduation limits:

Sieve Size	*Per Cent Passing*
10 mesh	85–100
20 "	30–45
35 "	0–5
80 "	0

2.4 *Emulsified Asphalt*

The emulsified asphalt shall be a homogeneous emulsion of asphalt and alkaline water, manufactured and stabilized without the use of soap or saponifiable substances, containing a total of not more than 1½ per cent of emulsifying and stabilizing agents. It shall be miscible with pure water in all proportions and shall show no separation of asphalt after thorough mixing, within thirty days after delivery, provided separation has not been caused by freezing or contamination.

When tested as herein specified, it shall conform to following requirements:

Viscosity—Saybolt-Furol—60 cc. at 25°C. (77°F.) ....40 to 100 sec
Miscibility ....Less than 4.5
Total Combined Amount of All Saponifiable Substances, including petroleum acids....... Not more than ¾ of 1 per cent
Specific Gravity—25°/25°C.(77°77°)..Not less than 1.00
Residue at 163°C.(325°F.)3 hrs., 50 gr. 55 to 60 per cent
Mixing Test ....Not more than 2 per cent, broken
Settlement, 10 days....Not more than 3
Sieve Test....Not more than 0.10 per cent
Demulsibility—50 ml. 0.10 N $CaCl_2$.... Not more than 2 per cent
Dehydration—100°F.—96 hours......Not less than 0.60
Film Adhesion....Not less than 75 per cent

Tests on residue from distilation shall conform to the following requirements:

Penetration at 25°C. (77°F.) 100 grs., 5 sec...100 to 200
Ductility at 60°F....Not less than 100 cms.
Proportion of Bitumen Soluble in Carbon Tetrachloride....Not less than 97 per cent
Solubility 86° Bé. Naphtha....Not less than 80 per cent
Specific Gravity at 77°F....1.00 to 1.025

2.41 *Sampling*—At least one sample of not less than one gallon shall be taken from each lot or shipment of the emulsified asphalt after arrival at destination. The samples shall be stored in clean, air-tight, glass containers at a temperature of not less than 40°F. nor more than 80°F. until tested. Demulsibility and Mixing Tests shall be made within thirty days from date of shipment. If samples fail to meet any of the specifications requirements, the material shall be rejected and shall be immediately removed from the site.

2.5 *Emulsion Test Methods*

The tests shall be made in accordance with A.S.T.M. Standards D-244-39, except as hereinafter specified.

2.51 *Residue at 163°C.*—A.S.T.M. Standards, Designation D 6-30, except that determination of residue shall be the average of three 50-gram samples heated for three hours in a dish or beaker not less than three inches in diameter and of sufficient depth to prevent overflow.

2.52 *Amount of Saponifiable Substances,* including petroleum acids, soaps, fatty or resinous acids and sulphonated oils in accordance with Test Method 37-E, as described on page 753 of the Third Edition of "Asphalt and Allied Substances" by Abraham.

2.53 *Specific Gravity*—A.S.T.M. Standards, Designation D 70-27.

2.54 *Dehydration at 100°F.*—The emulsion shall be quick-drying, and shall show a loss of not less than in 96 hours when tested by the following method:

One hundred grams of the emulsion to be tested shall be placed in a tared Pyrex dish, 77 mm. inside diameter by 40 mm. in height, having a flat bottom and straight sides. The dish shall be placed in the center of a shallow pan about five inches in diameter and 50 grams of anhydrous calcium chloride shall be spread in the pan so that it surrounds the dish containing the emulsion. The entire unit shall then be placed in a constant temperature oven set at 100°F. At the end of exactly 96 hours, during which time the sample shall not be disturbed by stirring or excessive movement, the loss of weight of the emulsion shall be determined. The dehydration loss shall be expressed as the ratio of loss in this test in 96 hours to loss in the test for "residue at 163° C," previously described.

2.55 *Mixing*—Fifty grams of High Early Strength Portland Cement, conforming with the "fineness requirements of A.S.T.M. Standard Specifications C74-36," shall be sieved through a No. 80 sieve and shall be placed in a tin having a capacity of approximately 500 cc. The emulsion to be tested shall be diluted with distilled water to a residue of 55 per cent, as determined in the test for "Residue at 163° C," previously described. One hundred cc. of the emulsion thus diluted shall be poured on the cement and stirred with a ½ inch steel rod sixty times during one minute. One hundred fifty cc. of distilled water shall then be added and stirred for three minutes. Ingredients and apparatus shall be maintained at a temperature of approximately 77°F. during mixing. Pour mixture through a tared 14 mesh iron wire sieve, rinsing until wash water is clear. Place screen in a tared shallow pan, heat until dry and weigh. The weight in grams of the material retained on the screen and in the pan is the percentage broken.

2.56 *Miscibility Test*—The maximum difference in residue between any of the three samples, taken from the middle, top, or bottom, shall be less than 4.5 when a sample is tested by the Downing Miscibility Test Method, described in the A.S.T.M. proceedings, 1934, Vol. 35, Part II, page 546, summarized as follows:

Apparatus

1. 500 ml. graduated cylinder.
2. 400 ml. Pyrex beaker, Griffin low type.
3. 3 glass tubes, 7 mm. OD, 5 mm. ID, 15 cm. in length, fitted with suitably bored #8 corks, adjusted as described below.
4. A strip of wood or metal, approximately 15 cm. long, 2.5 cm. wide, ½ mm. thick, with a one-cm. diameter hole in center.
5. 15 or 25 ml. porcelain crucibles, or 30 ml. Pyrex beakers.
6. Constant temperature oven, set at 163°C.
7. Analytical Balance, accurate to 0.1 mg.

Adjust the position of the corks on the glass tubes by placing 200 ml. water, 20°-25°C., in the 400 ml. beaker; place the strip across the top of the beaker and insert a tube through the hole. Adjust the position of the cork, so that when the tube is supported by the cork resting on the strip, the lower end is immersed in the water one cm. below the surface. In the same manner, adjust the second and third tubes so that the depth of immersion is 2.5 cm. and 4.6 cm., respectively.

Procedure. With the emulsion at 20°-25°C., measure 50 ml. in the graduate and place in the 400 ml. beaker. Wash the graduate with three 50 ml. portions of distilled water, 20°-25°C., and add to the beaker, the final volume being 200 ml. Stir until the emulsion and water are uniformly mixed, cover the beaker with a watch glass, and let stand without disturbance for two hours.

Weigh three crucibles or beakers to four decimal places. After the diluted emulsion has stood two hours, remove approximately a one-gram sample from the top layer into a cruicible or beaker, by using the one-cm. tube as a pipette. The top of the tube should be closed with the finger when inserting to the proper depth. After removal, remove adhering liquid on the outside of the tube with filter paper before transferring to crucible or beaker. Weigh crucible and emulsion to determine amount of sample. Repeat with samples from the middle and bottom taken with the second and third tubes. Place samples in oven at 163°C. for two hours, cool, weigh and calculate the amount of asphalt residue in the top, middle and bottom levels.

Note: About twelve drops of emulsion from above size tubes weigh one gram. With the top sample, it will be necessary to make several transfers to secure one gram, and about two with middle and bottom samples.

2.58 *Asphalt and Residue Tests:* Tests of asphalt and residue shall be made in accordance with A.S.T.M. Standard or Tentative Standards in effect at the time the test is made.

3.0 *Section I Stabilized Base:* Shall consist of mineral aggregate containing cementitious dust or clay binder uniformly mixed with Emulsified Asphalt and water.

3.1 *Preparation of Subgrade:* All weeds, sod, grass or other foreign material shall be removed from the subgrade. The ground shall be treated with a proven commercial brand of weed killer in the quantity recommended by the manufacturer for the permanent destruction of weed growth. Prior to placing subgrade seal, the subgrade shall be thoroughly compact, firm and unyielding, true to line and grade.

3.3 *Proportioning:* Four and one-half to six per cent, (based on dry weight of combined aggregate) of Emulsified Asphalt, as specified in paragraph 2.4, shall be used. Water used shall be the amount which results in a mortar-filled mixture of plastic consistency.

3.4 *Mixing:* The base course ingredients shall be mixed in a mechanical mixer of either rotary drum or pugmill type, or by hand methods in mortar boxes. Mixing shall continue until the emulsion is uniformly dispersed throughout the mixture as indicated by uniform color, and until there are no uncoated aggregate particles or lumps of clay or other balled fines. In case of rotary drum type mixer, the emulsion and water shall be placed in the mixer first, and followed by the base aggregates. In case of twin pugmill type mixer, this procedure shall be reversed.

3.5 *Placing* Two-inch thick wooden screed-strips of proper width shall be set on approximately ten foot centers, in parallel lines, lengthwise of the areas. The screed-strips shall be set accurately to grade and shall be rigidly supported in such a manner as to provide a depth of loose material sufficient to produce a finished base of specified thickness after compaction. The mixture shall be shoveled into place and screeded to uniform surface. Dumping en masse on the subgrade will not be permitted. Approved spreading devices may be used. The base shall be laid in continuous panels. As panels are completed, screed-strips shall be removed, length by length, following completion of screeding over each length or section, and the space shall be evenly filled with the base mixture.

3.6 *Compaction:* When the mixture will not displace, but is still plastic, rolling shall commence at the outer edges of the area and shall progress toward the center. The base shall be tested with a 10-foot straight-edge after the first rolling and high spots removed and low spots filled with base mixture. Rolling shall continue until the fine mortar in the base mixture flushes to the surface. The mixture shall be sprinkled with water if necessary to accomplish this result. Rolling shall continue at proper intervals until the base is hard, compact and unyielding. The finished base shall not vary more than ⅜ inch from a 10 foot straight-edge. Heavy hand rollers or power rollers weighing not more than three tons shall be used for initial rolling. Power rollers weighing not less than two and a half tons shall be used for final compaction.

3.7 *Drying:* Before the surface is constructed, the base shall be allowed to dry thoroughly and completely so that it contains not more than 5 per cent moisture. If shrinkage cracks appear during the drying period, they shall be filled prior to the construction of the wearing surface by forming a water and emulsion slurry of stabilized material scraped from the base. This slurry shall be bladed, broomed, and/or rolled into cracks until they are filled.

4.0 *Section II Leveling Course:* Shall be uniform mixture of emulsified asphalt and aggregates uniformly mixed and securely bonded to the stabilized base.

4.1 *Cleaning and Priming Base:* After the base has thoroughly dried—and not less than 48 hours after completion of final rolling—it shall be swept to remove all loose material on the surface. It shall then be dampened with water and a bond coat of emulsified asphalt as specified in paragraph 2.4,

diluted with an equal part of water, shall be broomed uniformly over the surface at the rate of ½ gallon per square yard. The bond coat shall be allowed to penetrate and set.

4.2 *Proportioning:* Aggregate for the Leveling Course as specified in paragraph 2.2 shall be mixed with emulsified asphalt as specified in paragraph 2.4, in proportions by weight, using the following formula:

$P = .05A$ plus $.12B$ plus $.55C$

in which

$P =$ the per cent of emulsified asphalt (based on dry weight of aggregate)
$A =$ the per cent of aggregate retained on a #10 sieve
$B =$ the per cent of aggregate passing a #10 sieve and retained on a #200 sieve
$C =$ the per cent of aggregate passing a #200 sieve, plus fines lost in wash test.

Where materials are to be proportioned by volume instead of by weight, the pounds of emulsified asphalt calculated as above shall be converted to gallons, assuming the binder to weigh 8.5 pounds per gallon.

4.3 *Mixing:* Mixing shall be as specified for the base in paragraph 3.4. (Excessive amount of water of sloppy mix shall be avoided.)

4.4 *Placing:* Placing of Leveling Course shall be as specified in paragraph 3.5 for base course except that wood or metal screed-strips shall be one-inch high. The screed shall also be used as a tamp to vibrate the mix in place. Any surface areas where course aggregate predominates shall be closed up with fine mortar, using long-handled floats. All joints shall be finished true to grade.

4.5 *Compacting:* Rolling shall be as specified in paragraph 3.6 for stabilized base. If the surface tends to shove or pick up when rolled, rolling shall be postponed until the surface has dried more thoroughly. When rolling is completed, the surface shall be true to grade and cross-section and shall not vary more than ⅛ inch from a 10-foot straight edge.

Section III Wearing Surface

5.1 *Cleaning and Priming Leveling Course:* Not less than twelve hours after final rolling, the surface to be covered shall be swept to remove all dust or loose materials. Emulsified asphalt as specified in paragraph 2.4, diluted in the proportion of one part emulsion to two parts clean water, shall be broomed over the area at the rate of ¼ gallon of the dilution per square yard.

7.0 *Type A, Bitumuls Asbestos Surface:* Shall consist of sanded texture asbestos finish as specified. It shall consist of two or more applications of Bitumuls Asbestos Filled Surface as specified in 7.1, color to be black, and in total amount of ⅕ gallon per square yard, applied only upon surfaces of smooth texture and uniform grade and cross-section.

7.1 *Mixing:* Bitumuls Asbestos Surface Material shall be mixed in the following proportions:

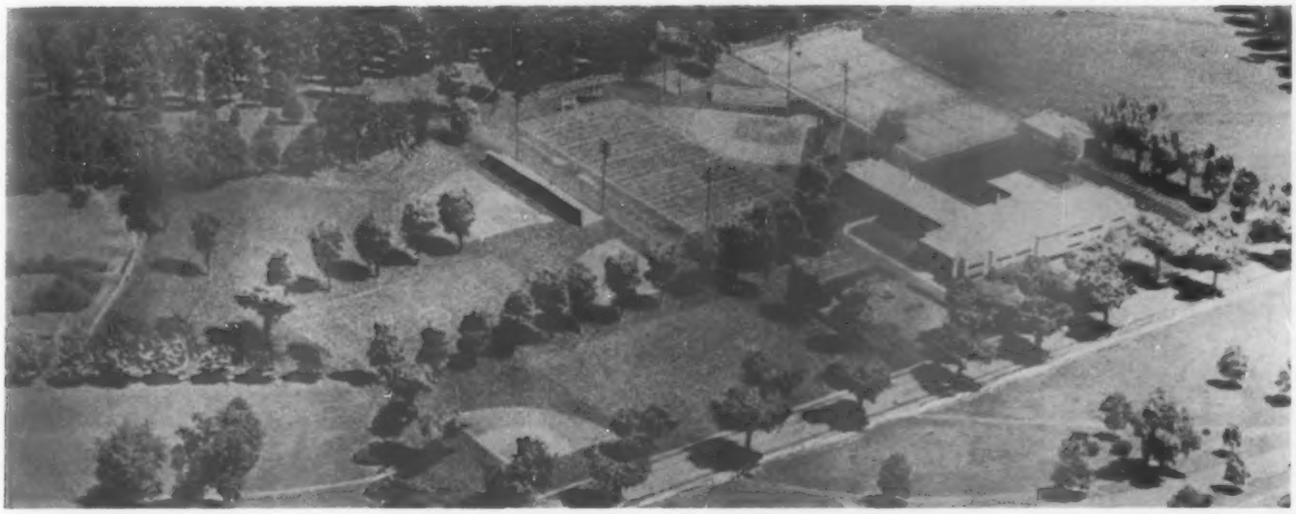
One cubic yard of plaster sand, 50 gallons of Bitumuls, 56 pounds of lime, and 140 pounds of asbestos.

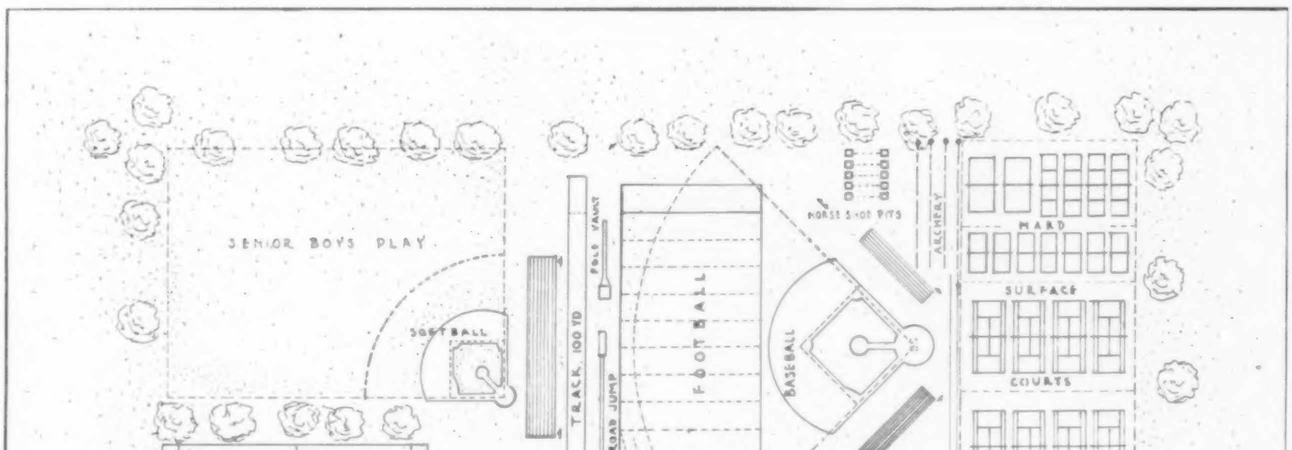
7.2 *Application:* The surface to be covered shall be swept to remove all dust or loose particles. The first application of the Bitumuls Asbestos Filled Surface shall be in a slightly more liquid state than the following applications, and the first application shall be made by brooming, using pressure for tight bond. Succeeding applications may be by means of brooms or squeegees. Each application shall be made only sufficiently heavy as to cover the surface uniformly and completely, and as many applications shall be made over all the area as required to apply a total of ⅕ gallon of the material per square yard.

7.3 *Rolling:* Not sooner than 12 hours after final application of Bitumuls Asbestos Filled Surface, the surface shall be thoroughly rolled with a power roller weighing not more than one ton, or by a heavy hand roller approved by the Engineer. When completed, the surface shall be true to grade and cross-section and shall not vary more than ⅛″ when tested with a ten-foot straight-edge.

7.3 *Protection:* The surface shall be opened to traffic at the direction of the Engineer, but not earlier than 24 hours after rolling.

8.0 *Type B Cork Filled Surface:* This surface shall be identical with the Bitumuls Asbestos Filled Surface and shall be mixed and applied in the same manner except that granulated cork is substituted for the Asbestos in the same proportion by volume.




SENIOR BOYS PLAY
SOFTBALL
TRACK, 100 YD
POLE VAULT
BROAD JUMP
FOOTBALL
BASEBALL
HORSE SHOE PITS
ARCHERY
HARD
SURFACE
COURTS
SENIOR GIRLS' PLAY
SOFTBALL
PARKING
GARAGE
BOWLING
SCHOOL
ELEMENTARY STUDENTS PLAY
SOFTBALL
SMALL CHILDRENS PLAY
DRIVEWAY
PHYSICAL EDUCATION & RECREATION LAYOUT
FOR
PROPOSED CENTRAL SCHOOL
SCALE 1" = 100'
SHIRLEY & DE SHAW ARCHITECTS
70 EAST 45TH ST
NEW YORK 17, NEW YORK

LIGHTING FOR SCHOOL BUILDINGS

By DON L. ESSEX

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Until he came to New York City to complete his graduate studies in 1928 at Teachers College, Columbia University, Mr. Essex attended, taught, and supervised schools in his native Indiana. He has been a member of the New York State Department of Education since 1931, serving as Associate Supervisor, Chief Bureau of Instructional Supervision (Elementary), and Director of School Buildings and Grounds Division since 1941.

NO PHASE of school building planning presents more confusion, is a subject of greater controversy, or is more challenging than the question of lighting, or as the National Council on Schoolhouse Construction calls it, *visual comfort and efficiency.*[1]

Until recently our entire thinking about school building lighting has been devoted to the quantity of light; i.e., the number of foot-candles. Throughout the years there has been a steady increase in the quantity recommended. In 1896, 0.4 of a foot-candle was recommended as the best average illumination. In 1914, the recommended level was 2.2 foot-candles. By 1931 it had risen to 10.9 and by 1938 to 15 foot-candles.[2] The inference has been that as the quantity of light increased, better seeing conditions automatically and inevitably improved.

We are now vigorously challenging this narrow foot-candle concept of good lighting. We are now concerned not only with the number of foot-candles, but also with the kind of company the foot-candle keeps. It is recognized that a classroom with 8 foot-candles conceivably might present better seeing conditions than a classroom with 20 or 30 foot-candles.

Number of Foot-candles Needed

Notwithstanding this shift of emphasis, the number of foot-candles needed for good seeing is an essential part of the lighting problem, and continues to excite controversy and to stimulate research. The 1938 American Recommended Practice of School Lighting,[3] published by the Illuminating Engineering Society, recommended 15 foot-candles for ordinary classroom and study-hall tasks. The 1947 revision of this publication [4] recommends 30 foot-candles for these tasks. Some specialists talk of 40, 50 or even 100 foot-candles. Where do we stop? What evidence is there that these higher levels are needed for effective school work?

Crane [2] reviewed the research bearing on this last question. Results of research were conflicting and confusing. But from his studies, Crane came to the conclusion that for ordinary reading tasks, as found in classrooms and study halls, 20 foot-candles at the

1. National Council on Schoolhouse Construction. *Guide for Planning School Plants* (Tentative). 1946. Price $1.00. Can be secured from W. D. McClurkin, Secretary, George Peabody College, Nashville, Tennessee.
2. Crane, Edmund H. *Visual Comfort and Efficiency in School Buildings.* A Report to the Special Committee of the New York State Education Department on Visual Comfort and Efficiency in School Buildings. Albany, New York. 1948.
3. Illuminating Engineering Society. *American Recommended Practice.* 51 Madison Avenue, New York City. 1938.
4. Illuminating Engineering Society. *Standard Practice of School Lighting.* Third draft, Third Revision. March 6, 1947. Scheduled for publication in summer of 1948.

desk level were adequate. It is on Crane's report, coupled with Gibson's [5] recommendations as set forth in the 1946 edition of the National Council on Schoolhouse Construction *Guide*,[1] that the New York State Department of Education is basing its current recommendation of 20 foot-candles for ordinary classrooms and study hall tasks. For other rooms and areas in the school building the New York State recommendations are as follows:

Location	*Minimum maintained foot-candles*	*Initial foot-candles*
Classrooms, study-halls, lecture rooms, libraries—on desks, tables, chalk and display boards	20	27
Offices—on desks	20	27
Sewing rooms, drafting rooms, art rooms and other rooms where fine detail work is to be done—on the work	30	40
Shops, laboratories—on the work	20	27
Gymnasiums, playrooms, swimming pools	20	27
Auditoriums, assembly rooms, cafeterias and other similar places if used for study	20	27
if not used for study	10	13
Corridors, stairs, passageways, and all indoor areas traversed by students	10	13
Locker rooms and toilets	10	13
Sightsaving classrooms—on desks, chalk and display boards	40	53

In addition to the provision of the general levels suggested, full allowance should be made for special tasks and additional local lighting be provided where the severity of the task requires it—over dictionary stands, over machines where fine work is done in the shop, where exacting measurements are made in the laboratory, etc.

A 25 to 30 per cent loss in illumination ordinarily may be expected in the months following the installation of lamps. This loss is due to deterioration of bulbs or tubes, the accumulation of dust and dirt on the light fixtures, and the inevitable soiling and discoloration of walls and ceilings. Because of this loss, the illumination at the time of installation of lamps should be substantially higher than the maintained level desired.

The Company the Foot-candle Keeps

Brightness differences constitute much of the company the foot-candle keeps.

A high brightness difference or contrast between the thing looked at and its immediate background is desirable; for example, the difference in brightness between printed words and the page on which they are printed, or between the thread and the cloth on which stitching is being done.

On the other hand, high brightness differences in the visual environment should be carefully limited: (1) between the task and immediate central visual area, as book and desk; (2) between the task and the remoter elements in the visual environment, as book and ceiling or walls; (3) between the luminaire and adjacent wall or ceiling area.

For a full detailed discussion of maximum brightness differences recommended, see the 1946 National Council *Guide*,[1] the 1947 I.E.S. report [4] and Crane's report.[2]

Natural Light

Notwithstanding the tremendous gains made in recent years in the field of artificial lighting, natural light is still considered the primary source of brightness in the school building. Indeed, efforts to increase the amount of natural light in school buildings have paralleled the improvement in artificial lighting. California has led the way in this movement in advocating one-story structures with single-loaded corridors which permit the use of types of multi-source lighting.

Unilateral Lighting

Since for many reasons most of our larger school buildings will be multi-story structures with double-loaded corridors, unilateral lighting will continue to prevail. However, certain of the old standards relating to unilateral lighting are badly in need of reexamination.

Consider the standard of the height-width ratio in a classroom. The traditional formula is that the width of the classroom should not be greater than twice the distance from the floor to the top of the window glass. The purpose of this standard was to insure uniform lighting throughout the classroom. We know that the standard falls far short of achieving this purpose. Actually, under this standard the amount of light near the windows is many times that near the inside wall of the room. But if the ratio were increased the inequality would be even greater.

The theory appears to have been based on the belief that the sun's rays come through a window at a 30 degree angle. This, with the misuse of a little trigonometry, would give something like a 2 to 1 ratio.

But even with southern exposure of a classroom the sun's rays enter a window at different angles, depending upon the time of day, the season, and the latitude of the community. The average angle may be about 30 degrees, but that particular angle does not occur often.

However, southern exposure for classrooms is not prevalent. Furthermore, particularly in northern states, the sky is frequently overcast and the direct rays of the sun do not reach classroom windows. Under these conditions light reaching the average classroom most of the time is not from the direct rays of the sun, but is reflected and diffused, entering the windows at varying angles. Obviously, there is little if any reliability in the 30 degree angle theory.

In the absence of a substitute it is well to hold to the 2 to 1 ratio, at least for the time being, and to accept it frankly on an empirical basis. Better an old, accepted formula, even though its effectiveness may be questioned, than no formula at all. People dealing habitually with standards do not discard the old for a void. There must be an acceptable substitute.

Another old stand-by that has been under fire for years and now seems to be steadily losing ground, is the standard that in the window wall of a classroom the windows should not extend nearer than six feet from the front wall of the room. The objectives of this standard were, (1) to make sure that children in the right rear of the room (when seated traditionally

5. Gibson, Charles D. *California State Department of Education.*

in rows paralleling the outside wall) did not look into glaring window light at the left front of the room, and (2) to prevent glare on the front blackboard. These objectives are as sound now as they were when originally stated, and probably the surest way to realize them is to provide the conventional "dead space" at the front of the window wall. But they can also be realized by other acceptable methods: (1) redirecting the seating arrangement so that rows (if used) angle away from the window wall with the narrow part of the angle at the rear; (2) louvering the front window to throw the light upward and away from the chalkboard; (3) placing display board of low reflective factor on the front wall near the windows; (4) tilting the chalkboard at a slight angle. If positive steps of this nature are taken, windows may well run from the extreme rear to the extreme front of the room, thus increasing the amount of light in the room.

It is traditional in classroom planning that window space should not be less than 20 per cent of the floor area. But why 20 per cent? Why not 23 per cent? 16 per cent? 18.2 per cent? It is doubtful if the 20 per cent ratio has any scientific basis. Since this ratio is relatively easy to attain—indeed it is exceeded in most modern planning—there seems to be ample justification for adhering to it. Again, it is good judgment not to discard a long-established standard unless a reliable substitute is provided.

The height of window sills presents a puzzling problem. Some feel that if the sills are too low the pupils' eyes may be exposed to excessive brightness. But if the sills are too high, pupils cannot see out and a depressing effect may result. Probably a good rule is that sills should be about desk height. This is low enough to give an opportunity for restful distant vision. Unless the immediate environs of the building are unusual, glare is not likely to result.

The arrangement of classroom windows should conform to the purposes of the room and should be designed to admit as much light as possible without shadows or high brightness ratios. As much window space should be provided as is compatible with strength of construction and control of light. Mullions should be as narrow as possible (modern construction makes it possible for them to be as narrow as 6 inches) and painted a light color to prevent excessive brightness contrasts.

The light from the top of the window is most effective in lighting the ceiling and hence the room. For that reason windows should reach as nearly to the ceiling as possible with not more than six inches between the top of the glass and the ceiling.

Bilateral Lighting

In the early days of school building planning windows were frequently placed on opposite sides of the classroom and sometimes on three or even four sides. This was particularly true of one-teacher buildings. Thousands of these buildings are still in use throughout the country. Such window placing created shadows and glare, and was the cause of much discomfort and probably much eyestrain. Because of these difficulties, unilateral lighting became the accepted practice and unilateral lighting requirements have been frozen into many state laws and codes.

In more recent years as the theory of balanced brightness and uniform distribution of light in classrooms came to be accepted, it became apparent that daylight from more than one source if properly controlled could help achieve these newer objectives.

Probably the most important advance along this line has been through the installation of clerestory windows on the wall of the classroom opposite the main window wall. These windows are placed near the ceiling and light reaches them over the roof of the corridor. (This means, of course, a depressed corridor ceiling.) It has been found that this arrangement contributes substantially to uniformity in the light of the rooms. Furthermore, the clerestory windows are high enough above the usual line of vision so that glare is eliminated. However, it is essential that the entry of direct sunlight be controlled.

The use of clerestory windows in the Far West has been effective. Whether they will be equally effective in sections of the country with heavy snowfall is yet to be determined. Experimentation to make this determination is now going on.

Glass Blocks

It would seem that eventually glass blocks will have a secure place in school building planning. Before the war they were used mainly in corridor ends and locker rooms. They appear to have considerable value as a part of the main fenestration of a classroom, but their use should still be considered experimental. Glass blocks of the directional type show the greatest promise.

Seating Arrangement

An improper seating arrangement can negate the best efforts of an architect to provide good seeing conditions in a classroom. The reference here is to seating a child so that he faces, or has his back to, a window for a substantial part of the day. In an effort, commendable in itself, to break away from rigid seating in rows, teachers have been known to group four pupils together so that one of the four pupils faces the window wall and one has his back to the windows. This arrangement, applied to the entire class, means that half the pupils are either working in their own shadows or else are squinting at the bright window light during most of the school day. This practice cannot be too severely condemned.

Fluorescent Lighting

Fluorescent lamps seem to be the coming method of providing artificial light in school buildings. This method is not yet clear of "bugs," but these should be cleared out in the near future. Present-day fixtures are not entirely satisfactory, but these undoubtedly will be improved as time goes by. In comparison with incandescent lights, installation cost is high, operation cost low. Because of heat problems, the higher maintained levels (30 foot-candles and above) can be secured only with fluorescent lamps.

In modernizing the lighting system of an old building, fluorescent lighting is particularly helpful in that higher levels of illumination can frequently be secured without changing the existing wiring.

Interior Finishes

Color schemes and ceiling, wall, and furniture finishes for classroom interiors should be selected to pro-

vide a pleasing, comfortable environment. Beyond that, however, color and the quality of finishes are an extremely important factor in the even distribution of light and should be selected with this in mind. Bright, glossy finishes reflect light badly and are a source of glare. Flat or matte finishes provide the diffuse reflection necessary to even distribution of light.

Ceilings should be a flat white or light tinted. They should have a reflection factor as near as possible to 80 per cent. (Acoustically treated ceilings should approach 60 per cent.) Walls should have a 50 per cent reflection factor from the ceiling line to the baseboard or floor, except that the first 2½ or 3 feet down from the ceiling should have a reflection factor of not less than 65 per cent. From this point down to the display board or chalkboard, the factor should be not less than 50 per cent. Chalkboards should have a 30 per cent factor; the wall below the chalkboard may be as low as 25 per cent. These variables may be blended or graduated from the ceiling down or they may be definitely lined or marked. Blending or graduating is better, for the reason that often a sharply defined border between two fields of different brightness tends to serve as a distraction. Furniture should be of light color, matte finish, and with a reflection factor of 30 per cent.

Regulations as Performance Standards

With the school lighting problem in a fluid state, agencies responsible for approving plans and specifications should not set requirements which cannot readily be modified. That is, lighting requirements should not be frozen into a code. Rather, lighting requirements should be performance standards. In this manner new methods of meeting the standards will not necessarily be excluded. Architects and engineers will be encouraged to use their ingenuity. Agencies will have an opportunity to approve any type of design that shows reasonable promise of giving the required performance. It is only under this type of standard that progress can be made.

Research in School Lighting

The most prolific experimenter and writer in the field of school lighting is Dr. Matthew Luckeish, Director, Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland. Over the years one of the severest critics of Dr. Luckeish's findings has been Dr. Miles A. Tinker of the University of Minnesota. School building planners should be familiar with Dr. Luckeish's latest book, *Light, Vision and Seeing*,[6] and also *The Science of Seeing* by Luckeish and Moss.[7] They should also be familiar with Dr. Tinker's writing and research studies in the field of school lighting, particularly his article, *Illumination Standards for Effective and Easy Seeing*.[8]

A new researcher in the field of school lighting is Dr. Darell Boyd Harmon of the Texas State Department of Health. Through experiments[9,10] with improved classroom lighting involving (a) redecoration; (b) changed pattern of seating; and (c) controls at the windows, Dr. Harmon found after a six-months' period (1942-43) the following startling improvements in the health of the pupils:

1. Reduction of 57.1 per cent in refractive eye problems.
2. Reduction of 90.1 per cent in non-refractive eye problems.
3. Reduction of 44.5 per cent in nutrition problems.
4. Reduction of 30.9 per cent in chronic infection problems (eye, nose, and throat).

In addition, Dr. Harmon reported a median educational growth of ten months in the experimental school and a median educational growth of six months in the control school. In other words, if a direct cause-effect relationship can be assumed (to the writer's knowledge Dr. Harmon does not make this assumption) improved lighting in the experimental school resulted in a 66⅔ per cent gain in educational achievement over a six-months' period.

A recent study made jointly by the Public Buildings Administration of the Federal Works Agency and the U. S. Public Health Service on the *Influence of Lighting, Eyesight, and Environment upon Work Production*[11] failed to produce any conclusive evidence on the influence of lighting on work production.

The study involved the work of 103 federal employees doing card punching in the Bureau of Internal Revenue. The employees were all working in the same room.

Quantity and quality of the illumination in the room were substantially improved. Walls, ceilings, and punching machines were redecorated with special reference to proper brightness ratios.

A great majority of the operators were pleased with the change in the visual environment. Notwithstanding an increase in the difficulty of the work which occurred during the period of the experiment, an improvement in production of 5.5 per cent was reported. In the absence of a control group and because of the difficulty of eliminating the effect of all influencing factors other than the improvement of the visual environment, the findings of the study must be considered indicative rather than conclusive. On this point the report of the study contains the following pertinent comment:

"There are numerous other factors of a psychological and physical nature that are very hard to measure, but that may have a strong influence on production records. For example, extremes of heat or cold, of humidity or dryness, may affect the work. The manner in which leisure time is employed may be reflected in work performances. Efficiency may be lowered following holidays or weekends. Living conditions and nutrition must be considered. Pressure of work or

6. Luckeish, Matthew. *Lighting, Vision and Seeing.* D. Van Nostrand Company, Inc. New York City. 1944.
7. Luckeish, Matthew, and Moss, F. K. *The Science of Seeing.* D. Van Nostrand Company, Inc., New York City. 1937.
8. Tinker, Miles A. *Illumination Standards for Effective and Easy Seeing.* Psychological Bulletin. September 1947.
9. Harmon, Darell Boyd. *Lighting and Child Development.* Illuminating Engineering. April 1945.
10. Harmon, Darell Boyd. *Light on Growing Children.* Architectural Record. February 1946.
11. Public Buildings Administration, Federal Works Agency. *The Influence of Lighting, Eyesight, and Environment upon Work Production.* Washington, D. C. December 1, 1947.

Exterior of building showing glass block installation above eye level and sunshelves above windows. Interior view demonstrates the even diffusion of daylight made possible through proper fenestration. Light - painted walls and ceilings serve as giant reflectors to balance contrast ratio.

Courtesy Insulux Products Division, Owens-Illinois Glass Company

Courtesy Luminall Paint Company

Combination of light - painted walls and ceiling and glass block installation provides near-perfect seeing conditions. Fluorescent lighting in this photo is not on and is not necessary except on darkest days.

Before-and-after views of classroom in Rosedale School, Austin, Texas, under exactly the same outdoor lighting conditions. Room is repainted, diffusers are mounted above the windows, and lighter furniture is installed.

Photos Courtesy Luminall Paint Company

Classroom below adds proper seating arrangements to light-painted walls, ceiling, and furniture for good seeing conditions.

overtime may increase fatigue. The all-important factor of employee-supervisor relationship cannot be evaluated, but the will to do one's best is definitely contagious."

Curiously, our writers and students in the field of school illumination seem to have overlooked a significant study carried on by the Western Electric Company in connection with the National Research Council of the National Academy of Sciences. The study was started in 1924 at the Hawthorne plant of the Western Electric Company and ran for a period of two and one-half years. Its purpose was to study the relation of quality and quantity of illumination to efficiency in industry.

Roethlisberger and Dickson report that the results of the study were negative.[12] Production increased in the "control" group—with *increasing* illumination (24 to 70 foot-candles); production also increased in the "test" group—with fairly constant illumination (16 to 28 foot-candles). Similarly production increased in the "control" groups—with decreasing illumination (10 to 3 foot-candles); production also increased with constant illumination (10 foot-candles).

In another experiment efficiency was maintained even when illumination was reduced to .06 of a foot-candle—an amount of light approximately equal to that of an ordinary moonlight night.

In still another experiment the illumination actually was held constant, but the operators were led to believe, first, that the illumination was being increased, and, second, that the illumination was being decreased. The operators commented favorably on the "improved" light and complained about the "poorer" light, but in neither situation was there any appreciable effect on output.

Roethlisberger makes the following significant observations about the experiments: [13]

"One thing was clear; the results were negative. Nothing of a positive nature had been learned about the relation of illumination to industrial efficiency. . . . It occurred to them (the experimenters) that the trouble . . . was with their notion regarding the way their subjects were supposed to behave—the notion of a simple cause-and-effect, direct relationship between certain physical changes in the workers' environment and the responses of the workers to these changes. Such a notion completely ignored the human meaning of these changes to the people who were subjected to them.

"In the illumination experiments, therefore, we have a classic example of trying to deal with a human situation in non-human terms. The experimenters had obtained no human data; they had been handling the electric-light bulbs and plotting average output curves. Hence, the results had no human significance."

12. Roethlisberger, F. J., and Dickson, William J. *Management and the Worker.* Harvard University Press. Cambridge, Mass. 1939. P. 14.
13. Roethlisberger, F. J. *Management and Morale.* Harvard University Press. Cambridge, Mass. 1941. P. 10.

Need for Further Research

It seems to the writer that in the past too much of the research in the field of school lighting has been of the narrow, laboratory type; that too little research has been done by independent agencies not subject to the charge of commercialization; that too much faith has been placed in the theory of a simple cause-and-effect, direct relationship between illumination conditions and pupil reaction; that too little attention has been given to the human factors involved.

There is an urgent need for a broad, comprehensive investigation of all phases of school lighting by a national body such as the American Educational Research Association. Financing should be adequate for a long-period survey in which there would be unlimited opportunity for studying the physiological, psychological, and educational aspects of the problems. Public health officials, general medical practitioners, ophthalmologists, educators, psychologists, sociologists, school plant specialists, illuminating engineers—all should have a hand in the study.

One of the critical questions to be resolved is this: Can natural light be abandoned as the main source of brightness in the classroom? In other words, can artificial lighting be considered the primary source of brightness and windows be used merely to see out of the classroom? The advantages of artificial lighting as the primary source of brightness are obvious; artificial lighting can be easily controlled; it can be constant; furthermore, if natural light can be abandoned as the main source of brightness, far greater flexibility can be achieved in planning the classrooms—height and width will no longer be troublesome problems.

Neither the school building specialists nor the illuminating engineer—nor indeed, any one professional group—has the experience or knowledge to provide the answer to this important question. This problem and many others just as important can be answered only on the basis of findings resulting from the broad comprehensive investigation suggested in the foregoing paragraphs.

GERMICIDAL LIGHT IN CLASSROOMS

By ISADORE ROSENFIELD

Architect and Hospital Consultant, New York City

Mr. Rosenfield was educated at Harvard and devoted his professional life from the beginning to hospital and school planning. Prior to entering private practice, he was for eight years assistant professor and special lecturer at the School of Architecture, New York University, and for ten years chief architect for the City of New York in charge of a $100 million hospital planning program. His present practice embraces hospitals for the State of New York, the Government of Puerto Rico, the Atomic Energy Commission, the Veterans Administration, and the Republic of Colombia.

SAFEGUARDING of food and the water supply and other sanitary measures including immunization have contributed in a significant measure to the practical banishment of many communicable diseases. We still have with us, however, many other diseases which apparently can be contracted by mere inhalation. Most frequent among this group are the common cold, pneumonia, acute rheumatic fever, meningitis, mumps, measles, chickenpox, and tuberculosis, all of which may be crippling and sometimes even fatal, either directly or through the complications that may follow them.

The process is very simple: when a person with a communicable disease exhales, or worse, if he sneezes or coughs, his breath generally carries the germs of that disease.

Two significant things happen to such exhalations outdoors: (1) they are diluted in the unlimited atmosphere, (2) the pathogens are destroyed primarily by the light of day. Indoors the above two factors operate to a more limited extent. Dilution is at its poorest, particularly in schools. In large classes with close seating and the ventilation system either nonexistent, or inoperative for reasons of "economy," instead of having a condition of dilution, we have a high concentration of pathogens in the atmosphere and in the dust settled out of the atmosphere.

I am sure the average reader like myself has been brought up with the idea of ventilation as a sort of expensive nicety . . . a matter of comfort of the more discerning genteel people . . . a conspicuous badge of being civilized. Actually, from the point of view of the bacterial content of the air, it is a matter of sickness or health and sometimes a matter of life or death.

But our subject is light, not ventilation. Here again we must clear up many misconceptions. As a result of the education, propaganda, and advertising heaped upon us by those who have a commercial stake in electric current and its applications, the average citizen knows more about artificial light than about the product of nature. So successful has the electric industry been that when the word "light" is mentioned, we automatically think of electric light and not of daylight. Many architects have become conditioned by this propaganda so that they think largely in terms of artificial sources for interior illumination—hence windowless offices, operating rooms and factories; subterranean restaurants, kitchens, etc. Even when thinking of windows, many architects do not think of daylight, but rather of "fenestration," and fenestration to them is first of all a matter of esthetics. When the average architect gives us windows, he doles them out, pursuant to his personal emotion or in conformance with the mode which goes under the name of "design." Light within buildings, whether natural or artificial, is of esthetic import of course, but its more important functions are to facilitate seeing, to give a psychological lift, and to exterminate harmful germs.

Intramural Daylight

Hitherto daylight has been admitted indoors through openings in the wall called windows. These are generally glazed. I am now designing several hospitals in the tropics. One of them, a children's hos-

pital, will have a grade school. These hospitals and the school will have neither windows nor glass. The building will consist primarily of floors supported on columns and the sides will be almost entirely open. In such cases daylight as well as the breeze will come indoors practically without interference (but they have to be controlled nevertheless). So far as germicidal daylight and ventilation are concerned, the interiors of such buildings resemble the outdoors to a considerable extent.

In the temperate zones we also can eliminate exterior walls to a great extent, but because of climatic conditions, in the present stage of technology, we have to cover the vertical exterior faces of buildings with glass. That, of course, shuts out the air to a considerable extent and induces concentration of the germ content of the intramural atmosphere. So far as daylight is concerned, the interior with an outside wall of glass will have as much light as the space under the proverbial "spreading chestnut tree."

But what germicidal good is ample indoor daylight if it has been filtered of its ultra-violet content upon passing through the glass? And is that really so?

Germicidal Properties

As a consequence of a series of experiments on the germicidal effectiveness of indoor daylight, Dr. Leon Buchbinder states that . . . "the effects of sunlight and daylight which had passed through the glass of a window and the glass covers of Petri plates were tested on streptococci and pneumococci which had settled out of the air into the bottoms of Petri plates. It was found that under those conditions *diffuse daylight was a patent lethal agent*. . . . The lethal effect of daylight was found to be dependent on both quantitative and qualitative factors. Diffuse daylight from blue skies exerted a maximal effect per foot-candle, whereas light from gray skies produced a minimal one. The total lethality even under overcast skies, however, was not insignificant. . . . Direct sunlight through glass (i.e., without the ultra-violet portion of the spectrum) under similar conditions was about ten times as potent as diffuse daylight. . . . It may be concluded then that if the air-borne route for respiratory infections is important, (1) the concentration in our environment of organisms of the types which cause these infections is reduced by natural daylight and sunlight, and (2) this suggests the planning of *a maximum of window space in new hospitals, schools, and homes*." [1]

Dr. Buchbinder's experiments are conclusive enough, but more dramatic evidence comes from England.[2]

During the war ground-floor windows of English hospitals were protected against shrapnel by heavy brick walls which caused ground-floor wards to be very poorly daylighted. A high incidence of respiratory infections was observed on the ground floor in contrast to observations made on the upper floors, where the windows were not protected. So striking was the difference that a study of the two environments was undertaken. The report states that ". . . the difference between them was so evident as to suggest the overriding operation of one factor, and the one positive factor appeared to be light. . . . Hemolytic streptococci were found to be most numerous in floor dust and were absent from many specimens of dust in the same wards collected from sites on or close to the windows. They were found more often in dust from exceptionally *dark wards* than in comparable specimens from normally lit wards. Hemolytic streptococci . . . in naturally infected dust . . . *survived in the dark at room temperature for 195 days*." The authors conclude that "*ordinary diffuse daylight is bactericidal to hemolytic streptococci*. The interposition of glass does not prevent this effect and it occurs even under winter conditions in England. These facts suggest the possibility that *good natural lighting* may be a factor in preventing the atmospheric spread of infection in surgical wards and elsewhere."

Therefore, it may be said, from a germicidal point of view, that:

1. The more indoor daylight, the better.
2. Sunlight is faster in its effectiveness than light reflected from the sky or clouds.
3. The less filtering daylight is subjected to in entering a room, the better, but *light from gray skies, even though filtered through two thicknesses of ordinary glass, is still germicidal*.

Spacing and Orientation

Our problem, therefore, is to plan buildings to insure their saturation with daylight, and the first step in this direction is proper spacing and orientation.

The principles of orientation are different in different climates. Thus, in the tropics where the sun is generally excessively bright and hot, the preferable orientation is away from the sun and in the direction of prevailing breezes. If the wind is generally from the south or west then it may be better to face the building accordingly, but in that case the direct glare of the sun must be eliminated through the use of vanes, louvers, shelves, or other means. It is difficult to formulate rules for the tropics; for instance, great altitudes there may take one into sub-arctic temperatures, in which case the problem in the tropics becomes the same as in more temperate latitudes.

In temperate zones buildings must be designed for two distinct climates: tropic in summer and sub-arctic in winter. To meet both conditions is the problem of northern architecture. In southern climates the architect's problem is ever so much simpler.

After spacing and orientation of buildings have been satisfied, there is still the problem of glass area in the exterior wall because spacing and orientation alone would be of no avail.

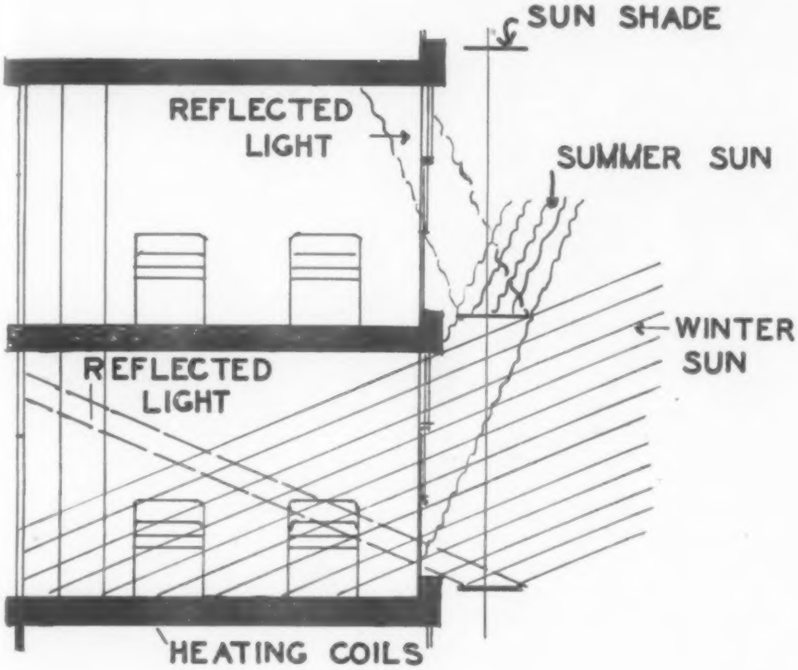
Problems of Big Windows

The civilized world has had hundreds of years' experience with individual windows, and accordingly has developed many devices for solving their problems. To what extent are these devices applicable to modern conditions? Without prejudice to individual windows where they may be justified, it must be admitted that the big windows or glass walls do present new problems; but these can be solved.

The first problem is control of strong sunlight when it is not wanted. This is usually solved by pulling

[1] The Transmission of Certain Infections of Respiratory Origin, *Journal of the American Medical Association*, February 28, 1942.

[2] Some Observations on Hospital Dust, with Special Reference to Light as a Hygienic Safeguard, Lawrence P. Garrod, M.D., F.R.C.P., *British Medical Journal*, February 19, 1944.



SECTION

Different exposures require different sun controls. One solution is a projecting sunshelf outside over the window placed so as to permit sunlight into the room when wanted and cut it off when desired.

SUN SHADE DETAIL

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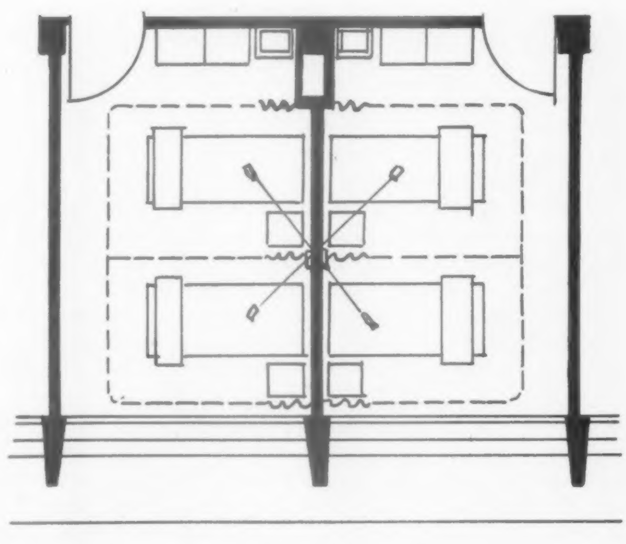


PLAN

down the shade; however, this eliminates ventilation and plunges the room into darkness.

A better way is to introduce a shelf, outside, over the window. It must be designed with regard for the solstice in relation to height and depth of the room. The shelf should be of such projection as to permit sunlight to penetrate the room in the months of the year when it is wanted, and to cut it off when it is not wanted. Of course Venetian blinds would in a measure take care of this problem, but they are not favored because they collect dust.

It is a mistake to try to solve the problems of all exposures with one device. Better results are obtainable if each exposure is analyzed separately, and treated accordingly. Such an approach may result in new esthetic opportunities for the alert, sensitive designer.[3]

One of the difficulties with the integral projecting sunshelf at the head of the window is that it involves the problem of drainage and leakage into the building at the juncture between shelf and wall or spandrel. In a current hospital design [4] the author and his associate designed the sunshades as independent shelves

[3] Sun Control Devices, Richard J. Neutra, *Progressive Architecture*, October, 1946.

[4] The Great Neck Memorial Hospital, the author and Edward D. Stone, Associates, Associated Architects.

bracketed out some distance away from the building. In this manner not only are leaks through the wall obviated, but a freer movement of air along the face of the building is achieved.

Direct sunlight and glare can also be controlled by the glass itself. Figured glass in the upper part of the opening would serve to diffuse light. On the other hand, glass is not always satisfactory as a diffusing agent because it may transform general glare into a myriad of glaring points.

There were on the market just prior to World War II clear plastic sheets with louvers cast into them, primarily for use in lighting fixtures. So far, this type of material has not had sufficient stability under extremes of heat and humidity to promise complete satisfaction, but the principle of its design is sound. Perhaps sheet glass can be manufactured with reflecting strips cast in, just as wire mesh is cast in at present.

Another set of problems has to do with heat or heat loss, and weather protection. The small window has the virtue of resulting in low heat loss. If weather-stripped and protected by storm sash or integral double glazing, it is perfectly satisfactory so far as heat loss is concerned. On the other hand, it does not bring much light or heat into the room when that would be desirable in winter.

For the "solar" house it is claimed that plenty of glass facing south actually brings heat into the house and thus cuts down the fuel bill, but consideration must be given to heat loss at nighttime and on days when there is no sun. This problem is being studied by Purdue University and preliminary reports indicate that at the location of the university the two factors about balance each other.[5] This balance will, of course, vary with meteorological conditions prevailing in a specific geographic location. The less daylight and sunlight in a given location, the more reason, from a germicidal point of view, to exploit it to the full with more glass.

There are still many unsolved problems, but for the present double sash or prefabricated double glazing and weather-stripping seem to do the job.

A third problem of large windows has to do with cost. Building professionals know that the individual window-in-the-wall is generally costlier than the equivalent masonry wall. A whole row of window units installed in a single wall opening is cheaper per unit than the individual window-in-the-wall, but still generally most costly than a masonry wall of equal area.

A recent study revealed the extent to which our thinking has been warped by the traditional approach. The individual traditional window has not only to supply light, but has also to protect the interior against intruders, weather, insects, strong light, and exterior temperatures; it has to furnish ventilation and insure privacy. When equipped to perform all these functions, it becomes expensive. As we multiply this kind of window unit we multiply hardware, storm sash or double glazing, weather-stripping, screens and shades. Thus a four-bed hospital ward, traditionally designed, would have two windows, each equipped with all the devices listed. The same ward, contemporarily designed, would have the equivalent of at least four such windows. Must all the gadgetry be repeated four times? Decidedly not. Two of the windows may be inoperative, permitting two sets of hardware and two screens to be omitted, reducing costs for the entire bank to total less than the cost of the masonry wall it displaces.

Clouding and frosting of glass has long been a problem, one fairly well solved for traditional windows by storm sash. Contemporary design calls not merely for more windows, but for larger areas of glass uninterrupted by muntins, mullions, or transom bars, in order to interfere as little as possible with the view outdoors. Storm sash in the same proportions are out of the question because of the difficulty and hazard of handling; yet without some protection much condensation may accumulate on the window sill and floor under certain conditions of relative indoor and outdoor temperature and humidity. In store show windows special drainage facilities are provided in the bottom members of the frames. A more plausible arrangement in schools would be double glazing, and the form of double glazing which offers the most positive protection would seem to be the factory-assembled unit consisting of two or more sheets of glass with mechanically sealed edges and dehydrated air spaces between them.

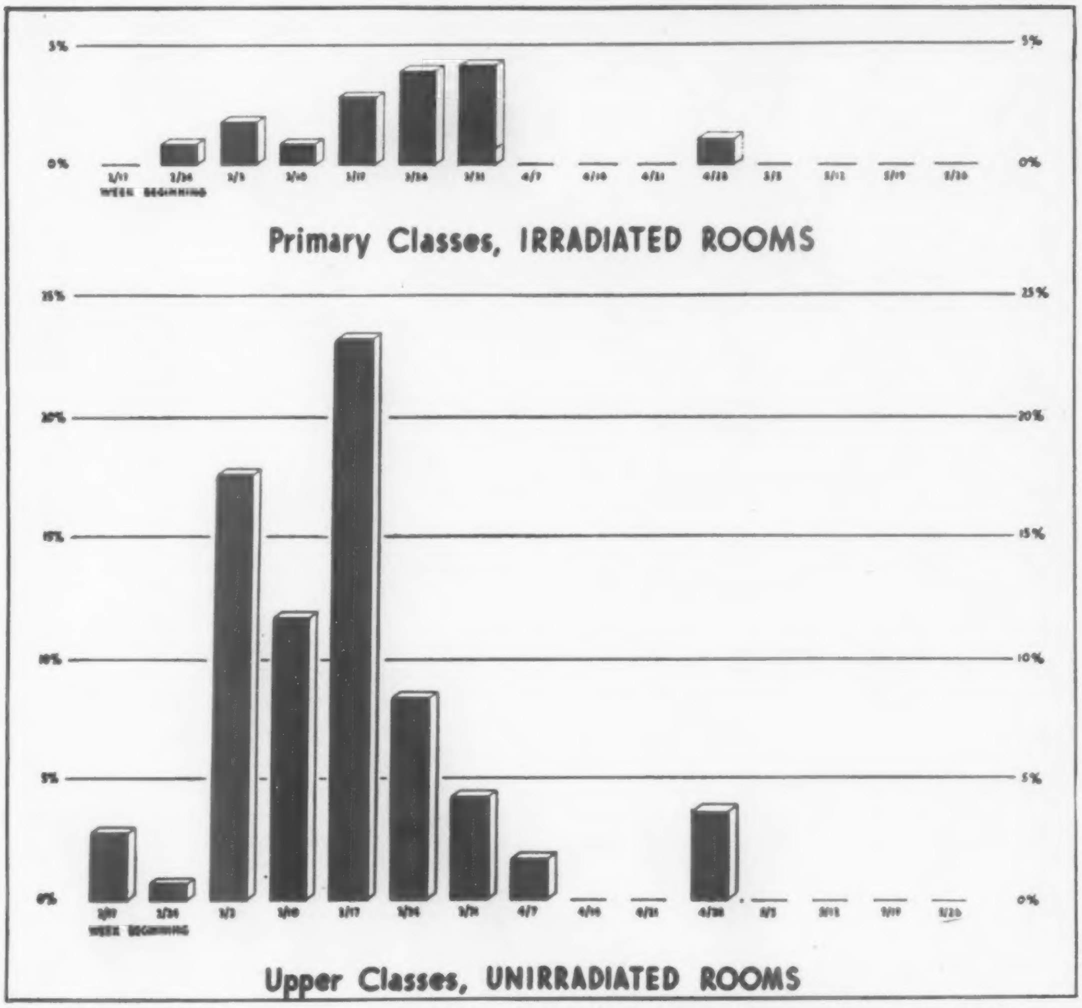
Actinic glass transmits about 60 per cent of the ultra-violet spectrum. Although it loses some of this property during the first year or so after installation, enough remains to merit consideration. When it first came into use it was heralded as a health-contributing agent. As far as I know there is insufficient evidence to bear this out with respect to humans who wear clothing indoors and, who therefore are not directly exposed to the healthful ultra-violet rays. Little attention, however, has been paid to its germicidal potency despite the fact that ultra-violet radiation is known to be lethal to pathogenic organisms. Other factors being equal, actinic glass is preferable to ordinary glass from the germicidal point of view.

We Don't Know All About Daylight

We know that, if there is such a thing as too much glare under certain conditions, there is no such thing as too much glass, because with the utmost glass it would still be impossible to obtain outdoor conditions; yet the maximum of daylight, once obtained, can be controlled with well-tested devices. But merely to conclude that the more glass the better is not enough. It is sound in direction, but not specific in its course.

We have yet to learn a great deal about light in terms of window arrangement, shielding from excessive sunlight, and the qualities of glass itself. The bacteriological experiments referred to are proof enough that we need to admit more daylight into interiors, but they fall far short of informing architects of the techniques of proper installation. In such research scientists have so far been concerned with one question only: Is daylight, passing through ordinary glass, lethal to germs? The answer is yes. What the architect wants to know is: What is the relation in germicidal effectiveness between glass of single thickness, double thickness, one-eighth inch plate glass, one-quarter inch plate glass; what if storm sash are used; what if prefabricated double glazing employing

[5] The Solar House, F. W. Hutchinson, *Progressive Architecture*, May, 1947



Measles, 1941, Germantown Friends School. Weekly attack rate among susceptibles in irradiated and unirradiated rooms, not including home secondary cases.

different thicknesses of glass, or two sheets or three sheets, are used; what of the various kinds of figured and tinted glass? If actinic glass is more lethal than an equivalent thickness of ordinary glass, then in what form is it obtainable, and is the difference of lethality sufficient to compensate for the difference in cost? Other things being equal, what is the relationship between lethality and depth and height of the room?

Suggested Experiment

In order to determine more nearly the germicidal value of daylight under schoolroom conditions, I presume to suggest the following line of experimentation:

Comparable schools as to the number of grades, orientation, home environment of the students, plan and section of rooms, etc., should be selected. One of these should be a school of the older vintage with a minimum of window space per classroom. The other should be an ultra-modern school with a maximal amount of glass.

The first comparative study should be with appropriate pathogens in Petri dishes, with separate records kept for the row of desks nearest the window, the next row, and so on until the corridor partition is reached.

The second study should be in terms of the pupils' health; again comparing the two schools and the various rows of desks with respect to distance from the windows.

Conceivably such a study may suggest departures from the traditional classroom floor plans and cross sections.

Artificial Ultra-violet

That ultra-violet irradiation is germicidal is so well established that it is not necessary to make reference to original sources to prove it. In the last two decades experiments have been conducted primarily with artificial sources (ultra-violet lamps) and largely in hospitals and soldiers' barracks. In hospitals artificial ultra-violet has many applications of proved efficiency. The principal contribution of the barracks experiments seems to lie in the determination of the ultra-violet threshold or saturation which is requisite to effectiveness.

In schools we have two or three interesting examples. One study is by W. F. Wells and M. W. Wilder [6] and was made in certain schools in Phila-

[6] Environmental Control of Epidemic Spread of Contagion *Aerobiology*, publication of the American Association for the Advancement of Science, Washington, D. C.

delphia during an epidemic of measles. On the face of it, the evidence concerning the effectiveness of ultraviolet irradiation seems pretty positive. However, the following factors do not appear to have been taken into account:

The schools (some being private) appear to represent a high order of home physical and cultural environment.

Since the classes were small (apparently 15 to 20 students) and the rooms large, we have here a "high ventilation density threshold."

The account of the experiment does not appear to take into consideration either the nature of natural or artificial ventilation, nor the extent of daylight.

Since "raising threshold density by sanitary ventilation diminishes the rate of spread of contagion," one wonders whether it would not be cheaper and more wholesome to resort to ventilation instead of artificial ultra-violet irradiation.[7]

The second notable school experiment was conducted by the New York State Department of Health in three up-state rural centralized schools during the measles epidemic in the school season of 1945-46.

One school had all classrooms irradiated. The other had one set of grades irradiated and a parallel set of grades unirradiated. The third school was not irradiated at all and was considered the control.

The percentages of total cases in the kindergarten and the first six grades for the entire school season show a remarkable absence of significant difference between the three schools. The per cent of susceptible children who developed measles under the different conditions were as follows: the fully irradiated school had 77.6 per cent, the half-irradiated school had 86.2 per cent for the irradiated classrooms and 81.5 per cent for the unirradiated, and the wholly unirradiated school had 69.4 per cent. The only difference observed between the schools is that in the half-irradiated and unirradiated schools the epidemic was sudden, short and explosive and then petered out almost completely, whereas in the fully irradiated school it lingered on for months.[8]

The conclusion of the authors of the study is that upon the basis of these findings, the routine installation of ultra-violet lamps in classrooms is not indicated."

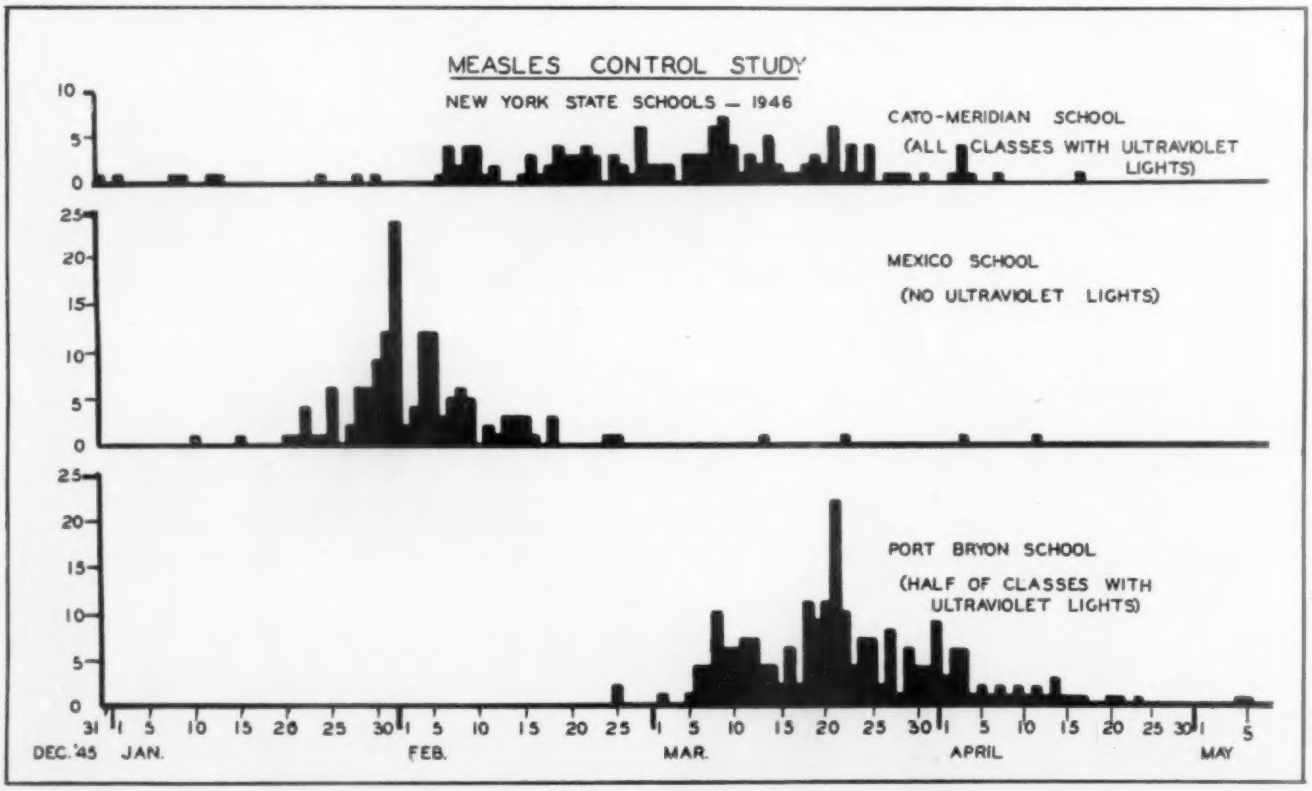
It would appear that there are three principal factors which nullify to a large extent the effectiveness of ultra-violet irradiation in a typical classroom.

1. Even with the highest safe threshold of ultraviolet saturation of the atmosphere, under usual circumstances and crowding, pathogens released by one person can be inhaled by another before the ultra-violet irradiation takes effect.
2. Even if ultra-violet irradiation were fully effective in the classroom, it appears to be nullified by the contacts in the bus, the home, the movies, the Sunday School, etc.
3. The ultra-violet irradiation cannot reach the germ-laden dust on the floor, particularly under desks.

These three points, just made, should not be taken with finality. They merely indicate that ultra-violet irradiation or other means of counteracting contagion

[7] "A Study of Cross Infections Over Forty Years," B. A. Peters, M.D., D.P.H., indicates that ventilation is a telling factor in keeping down cross infection. *The Medical Officer*, March 2, 1946.

[8] Effect of Ultra-Violet Irradiation of Classrooms on Spread of Measles in Large Rural Central Schools, J. E. Perkins, M.D., A. M. Bahlke, M.D., and H. F. Silverman, *American Journal of Public Health*, May, 1947.



through the atmosphere must be further studied and extended to all conditions of enclosed environment.

Further doubt on the use of artificial ultra-violet in the classroom comes from a study by the State of New York Department of Health during a large epidemic of mumps in the school season of **1946-47**. The data obtained have not gone through final analysis, but in the meantime Dr. Anne M. Bahlke informs me that "there was no difference in the attack rate for mumps in the irradiated classrooms . . . as compared with classrooms without lamps. Moreover, difference in chronological pattern which occurred in the measles epidemic was not observed with mumps." [9]

Artificial Sources

Natural light or daylight has the illuminating and the germicidal properties in one. Not so with artificial sources. Ordinary incandescent or fluorescent (hot or cold cathode) sources are not materially germicidal. Only ultra-violet sources are. To obtain an artificial germicidal agency in a classroom or assembly hall it is necessary, therefore, to install two sets of fixtures: one for light and the other for germicidal purposes. It is conceivable that in time the same lighting fixture will carry illumination and germicidal sources thus reducing cost. However, in the present state of technology, the feasibility of so doing is not indicated.

Wall fixtures are used for general atmospheric irradiation. Where rooms are very deep, pendant fixtures must be used in the middle where wall brackets would otherwise not reach.

Both hot and cold cathode tubes are used. Where many sources are involved it is more economical to use hot cathode. Hot cathode lamps are cheaper than cold cathode, but they also deteriorate faster. This is not a serious problem because if an effort is made to replace lamps in a roughly staggered fashion, the new lamps with the old will produce an overall satisfactory threshold.

All of the above sounds quite simple, but it is not. The application of ultra-violet is fraught with dangers. It is a young instrumentality and must be used with caution. Many of its problems have not yet been solved, and much remains to be learned.

The following are some of the difficulties:

1. Unduly exposing the eye to ultra-violet rays causes eye inflammation known as conjunctivitis. To meet this danger manufacturers no longer advocate direct exposure of tubes, but instead recommend placing them in an upward and forward reflector which is hung as a pendant or attached to the wall as a bracket.
2. The higher the intensity of the source, the more reflection there is from the ceiling. Experience shows that even reflections can be injurious to the eye and skin. The Council of Physical Medicine of the American Medical Association reports inflammation of the conjunctiva and a facial rash sustained by a speaker on a rostrum from reflected ultra-violet rays which occurred in a schoolroom in which ultra-violet disinfecting lamps were used in the form of wall brackets. Reflections from the ceiling burned the head of a baldheaded teacher, and an investigator who made the ultra-violet intensity measurements fared no better.[10] Drs. Wells and Bahlke, both report irritation to the eyes and burns of the skin of teachers who stand up a good deal in the process of teaching and are thus closer to the source of irradiation.
3. While not every finished surface has a high enough reflection factor to be a serious problem in design, some types of paint are better reflectors than others. Thus oil paints are much poorer reflectors than water paints or unfinished plaster surfaces. Highly gloss paints are better reflectors than flat paints. Blue or purple colors are poor reflectors of ultra-violet. Ultra-violet rays will brown many paint vehicles, drapes and wallpapers. Much investigative work is being done in this field and shortly we may expect to have more concrete data to go on.

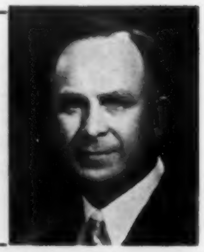
In conclusion it may be said that natural window light and artificial ultra-violet are germicidal, but their specific application in schools and related environments still calls for much study. They must also be studied in relation to each other and, finally, it is necessary to study possible substitutes, such as natural and artificial ventilation as well as other methods such as chemical air sprays, floor oiling and the like.

[9] The results of this study will be published. Those interested should write to the State of New York Department of Health, Albany, N. Y.

[10] *JAMA* 129:1166-H67, Dec. 22, 1945. See also Regulations of Acceptance of Ultraviolet Lamps for Disinfecting Purposes, *JAMA* 1221503, June 19, 1943.

Good lighting for classrooms need no longer be a problem.

A Michigan resident, George Schulz graduated from the School of Architecture at the University of Michigan. He received his preliminary architectural experience in the firm of Malcomson and Higginbotham. Since 1924 Mr. Schulz has been Director of Building Planning at the Detroit Board of Education in charge of the school building program and the planning of new school buildings. He is a member of the American Institute of Architects.



NEW WINDOW DESIGN

By GEORGE SCHULZ

Director, Department of Building Planning, Detroit Public Schools

FOR many years the problem of the proper type of fenestration has been a subject of continued study. Fenestration has evolved largely from the development of various styles of architectural design and its detail using various types of sash units such as the old-fashioned, time-proven, double-hung wood sash, steel sash, aluminum sash, etc. Heretofore most architects have worked in the various types of architectural style, trying in every way possible to adapt period designs and various other forms of architectural solutions to the design of school buildings.

School buildings are built fundamentally for the education of youngsters. Their construction is not necessarily a matter of attempting to conform styles of architecture to school buildings, but rather a wholehearted attempt to obtain adequate light within the schoolrooms so that the instructional facilities will be enhanced and proper living conditions will be provided within the room—all of which goes back to the necessity of designing architecturally to obtain the maximum in daylight. More beautiful school buildings, architecturally speaking, have been built only to be found lacking in adequate light supply to make learning possible without ruining children's eyesight.

The architectural profession as a whole, in recognizing this problem, has groped for improved methods of accomplishing the desired results, and has revised its architectural designs to provide for narrower masonry surfaces and larger and more adequate fenestration areas. However, this struggle has been carried on for years always with the use of various types of manufactured sash and the use of clear glass windows shaded on the interior by curtains in an effort to control the amount of light which comes through from the natural source, the sun. The sun is the greatest source of all light, but is probably the most difficult natural element to control in order to prevent eye strain and its resultant reaction on the human system.

The shading problem has been with us for a long period of time and has continually caused difficulty throughout various school systems. Shading was formerly considered a necessary evil, but at the same time it caused maintenance problems, light control problems, and actually cut down a large percentage of the light necessary to carry on ordinary classroom activities. This problem has long been recognized by

Installation of glass block above eye level eliminates sun glare.

the Detroit Board of Education, which as far back as 1927 made efforts to introduce an adequate supply of natural daylight into all school buildings by some other means than the use of clear glass, shaded to control the quantity of light and the sun rays so difficult to work under.

First Experiments

In an effort to provide adequate light supply to the rear areas of our classrooms, we introduced a so-called lense-rib light diffusing glass in the upper panes of our sash, dropping our shades to a lower level in order to obtain the natural light coming through the glass, but eliminating the excessive brightness resulting from direct sun rays. It was an attempt to do something about a problem which has been irritating, not only because of the need to obtain adequate light within the room, but also because of the unsightly appearance presented by a school with shades drawn to various levels. Rules were made to enforce teachers to maintain shades at given levels throughout the day, but continuous difficulties arose in accomplishing this. Our first attempt to control light was not a success, but it called attention more specifically to the necessity of trying to do something about this light problem.

Always on the alert for new materials to assist in our efforts to do this job, we were interested in the development of a material known as glass block. Attempts were made to sell our Board of Education this type of material many years ago, but we did not accept the recommendation to use this material for classrooms. It was felt that the block itself would not do the work which we were sure was necessary: that is, the carrying of the light rays of the block to the rear area of the classrooms to get a more uniform light distribution over the entire room area. This job had to be done in such a way that the living conditions within the room would be entirely satisfactory to the student body and to the teachers who were to carry on their activities within the classroom. It meant that the overall area had to be given as far as possible a uniform light distribution which could be controlled without the use of shades.

Manufacturing Research

The glass block manufacturers, being faced with the adverse reactions to the use of this material for fenestration purposes where it was necessary to do close desk work, ultimately developed a prismatic glass block design which picked up the sun ray on the exterior surface, carried this ray to the inside surface, and reflected the sun ray upward and across the room in a way which certainly brought out a greater light diffusion than had been heretofore possible. When the glass companies recognized this problem and developed this type of material, we became interested to the point where we observed light directional experiments of the glass block and were satisfied in our own minds that this material would be acceptable only under the condition that eyestrain caused by sun glare would be eliminated. The glass companies made further efforts to introduce non-glare characteristics in the design of the light directional glass blocks being manufactured. Experiments seemed to indicate to us that if a given pattern of a prismatic design of glass block were installed in the exterior wall of a building at a point sufficiently above the floor level so that the major portions of the bright sun rays would be above the eye level, there would be practically no sun glare.

When these physical characteristics of the glass block were known we became interested in their use and proceeded to design several new buildings using a combination of glass block and steel sash set up in architectural designs in a way to provide an offset in the vertical plane of the window fenestration. This was intended to keep the disturbing ray of the sun almost completely out of the room and still have maximum daylight diffusion within the room. The elimination of window shades was also an important

consideration in the acceptance of the material known as glass block in developing our architectural designs. The non-glare feature together with the light-diffusion characteristic voided the necessity of window shades and gave a high percentage of light distribution over the working surfaces of students' desks throughout the entire area of the classroom.

Other Considerations

Since the acceptance of the use of glass block as a basis of exterior school building design, we have awaited with a tremendous amount of interest the final results of our architectural redesign of our new school buildings on the basis of the use of this modern and more recently developed glass block. With the adoption of this type of fenestration we also studied the use of color within our classrooms, the finish of ceilings, walls, floors, and interior woodwork. In order to obtain the maximum benefits which we hope to derive from the use of this newer type of fenestration all interior classroom surfaces were finished in colors providing the greatest light reflection characteristics. Ceiling surfaces were painted white and wall surfaces were developed in pastel colors with the light reflecting efficiency approximately 80 per cent. Our floors were finished light with a light reflectivity of approximately 35 per cent. Interior cabinet work and trim have been finished almost silvery white. In all these considerations we had but one thought in mind and that was to provide a light, bright, cheerful classroom atmosphere with the maximum possible light at the working surfaces of the children's desks, at the same time, providing comfort and freedom from eyestrain as far as it is humanly possible.

We have at the present time three buildings completed with the type of exterior wall fenestration described. Throughout the entire period of their construction we have noted the physical changes resulting from the introduction of this material. With the completion of our buildings, having followed the pattern set up in an effort to obtain the results desired in finishing the interiors of our classrooms, we found we had an atmosphere of lightness and brightness in our classrooms of which we could be very proud. However, we still had to obtain the reaction of the pupils and the teaching staff working in these rooms, which in our opinion would be the determining factor as to the success or failure of our design. Up to the present time, whether the days have been dull or whether the days have been sunny, we have yet to find one teacher or principal who has not been tremendously pleased to be working in rooms such as have been provided for them. Many of the teachers and principals have commented that they hoped they would never have to go back to one of the older buildings to teach again.

At the outset we were somewhat concerned as to whether we would be successful in preventing the direct rays of the sun from striking the desk surfaces within the classrooms. It would appear that the solution that was considered and actually constructed into these buildings was on the right track. However, the sun rays of the shortest days of the year have carried beyond the first row of desks, although the strength of the sun ray has been such that there has been no particular inconvenience to the student and this occurs only for less than one hour in the morning before the angle of the sun ray increased in height from the horizontal to a point where the first row of desks was actually free from the disturbing sun ray. This would indicate in our opinion that as the days become longer and the height of the sun's rays increases, we will not be concerned with the sun's hitting the desk surfaces. This should give us the results which we planned for—a completely daylighted room without the disturbance of high sun intensity.

Analysis of Results

What are some of the assets and debits resulting from the use of this type of fenestration in our school building designs? It would appear that we no doubt are on the right track as far as fenestration is concerned. We believe we have almost completely eliminated the shading problems except where visual aids are used in classrooms. We have obtained the benefits of a highly insulated wall surface by the introduction of the glass block in at least three-quarters of the wall area used for fenestration purposes. This in itself results in a great saving in fuel consumption and at the same time provides insulation against the hot heat rays developed during the warmer months of the year.

We have introduced a problem in glass replacement in the sense that glass blocks are set in cement mortar while ordinary glass is set in putty. However, we reason this way. Glass breakage is generally the result of vandalism and is extremely high in a school system such as in the city of Detroit. A glass panel in ordinary sash, when broken during the winter months, must be covered as well as possible until such time as replacement can be made. This results in a tremendous loss of heat and also an increase in fuel consumption and it does take time to obtain glass for replacement purposes in a system of this type. To work out on a platform in cold weather is a slow and costly operation and the replacement cost per unit of glass is high. It is reasoned that breaks in glass block as a rule would occur only in the exterior face. The prismatic design of the block provides additional reinforcement which prevents easy breakage. Furthermore, the breaking of the exterior surface of a block does not open up the side of the building, and as a result would not be the cause of excessive heat loss and classroom discomfort. It is felt that when glass block breakage occurs, the replacement can be taken care of during the warm summer months when the productivity of man is increased due to better climatic working conditions at no increase in cost of replacement. Thus there may be an actual decrease in overall replacement costs, largely because of the additional strength obtained by the prismatic design of the glass block surfaces and the resultant resistance to breakage of this material. There are no records available at the present time showing comparative replacement costs of glass block and clear glass, and we will watch with interest the costs involved in taking care of this breakage problem.

It appears to us that the advantages gained by the introduction of this material in providing better and more efficiently lighted classrooms, together with some of the resultant by-products obtained such as its insulating qualities, should materially benefit the pupils, teachers, and the school system.

HOW MANY PLUMBING FIXTURES?

By FRANCIS R. SCHERER

Superintendent of School Buildings, Rochester, New York

Mr. Scherer attended University College in Dublin and graduated from the University of Michigan where he received an M.S.E. degree in 1922 and an M.E. in 1930. He has been superintendent of school buildings in Rochester since 1933. He is director of the Association of School Business Officials and Chairman of the Committee on Safety to Life, National Fire Protection Association.

IF ONE CARES to investigate the relation of the number of plumbing fixtures to school enrollment as determined by statute or regulation of various states and cities, he will find a miscellany of ratios varying to such extremes as to indicate that the figures could not have been objectively determined.

In 1935 the National Council on Schoolhouse Construction, the membership of which includes state and city school building directors and architects, adopted standards relative to adequate sanitary facilities, but frankly admitted that such standards were subjectively derived, and recommended their use only until subsequent research would provide more adequate ratios. In 1938 the Architectural Commission of the New York City Board of Education made the following observation in the section of its report dealing with the use of sanitary facilities.

> "The health of the pupils is dependent to a large degree upon the toilet, washing, and drinking fountain facilities. For this reason, one of the most important problems involved in school planning and administration concerns the number and arrangement of such facilities. . . .
>
> "The Commission believes that in the interests of good health, it is inadvisable to limit toilet use in any way to certain periods or activities. Pupils should be encouraged to use the sanitary facilities. . . .
>
> "It is surprising to find such a divergence of opinion on the part of educational authorities and such wide variation in the regulations established by cities and states. Practically all regulations have been determined without any check on the use of the toilet facilities by pupils during the various periods of the day. Most educators admit that this problem is still unsolved and are intensely interested in finding the correct solution."

The Committee on School Plant Research of the American Council on Education designated one of its members, Francis R. Scherer, to make a study of the utilization of school sanitary facilities. The hope was that the field data would be such that a reasonable guide could be established from factual data which would more truly reflect a proper ratio for the various plumbing fixtures needed in the elementary and secondary schools.

With the generous permission of the Board of Education at Rochester, N. Y., field survey groups conducted tentative studies in 1939 in one elementary and one high school for the purpose of developing and improving techniques which could be employed in a nationwide survey. Thus was the procedure established and adopted for the 39 schools in the 25 cities and counties of 15 states that participated in the complete study. The cooperating schools studied had a total membership of 40,000 pupils. Briefly described, the procedure consisted of a record at each one-minute period throughout one regular school day for each of all the toilet fixtures in the school. Thus a summary of the time-use charts for all toilet rooms in the school indicated the actual maximum simultaneous use made of the sanitary facilities for each minute of the entire school day. A majority of the schools made two separate studies, some months apart, so as to confirm their data.

Since the accuracy of the field data in the study depended to a considerable degree upon the complete cooperation and understanding of all observers who were asked to indicate on the appropriate sheets the utilization of all toilet units through the entire period of the school day, it was necessary to establish the following practices:

1. Location in each toilet room of a clock sufficiently large to enable the observers to record time to the minute.
2. Care that the activities and attitudes of observers did not disturb pupils in their toileting habits. It was found desirable to have as observers of younger persons preferably those who had re-

cently completed high school and thus were more familiar with pupils' habits. In only two instances did it appear that the presence of observers had any influence upon pupils in their toilet habits.

3. Assembling, summarizing, and tabulation of all data sheets by a single clerical staff in order to reduce the number of possible errors which might result from different interpretations of the directions to the observers in the various schools.

In order to permit comparisons between schools, the data collected on the observation charts were summarized in two major groups: (1) elementary schools and consolidated schools, and (2) high schools.

Utilization of Water Closets

Data on the utilization of toilet facilities were collected for nineteen elementary schools, six consolidated schools in rural areas, and fifteen high schools. The pupil enrollments of the elementary and consolidated schools included in this study ranged from 160 to 1,320, and for the high schools the range was from 259 to 3,899 pupils.

All of the schools appeared to have an adequate number of boys' water closets, since the observers reported only very little waiting in one high school and no waiting in the remaining schools. On the basis of the present enrollment of boys in these schools, the number of boys for each installed water closet in the elementary and consolidated schools ranges from 17 to 60, with two of the schools having ratios of less than 1:40. In the case of the high schools, there was greater variation, since the ratios ranged from 1:17 to 1:92.

On the basis of the load upon the units at the period of maximum utilization as reported by the observers, the range of the ratios was from 1:45 to 1:357 for the elementary and consolidated schools and from 1:73 to 1:456 for the high schools. It was apparent that there is very little correlation between the ratios for the number of units installed as compared with those for the utilization of such units at their peak periods.

With respect to the installation and utilization of girls' water closets, evidence of the installation of a number of excessive units is not as clear. However, the observers reported only a limited amount of waiting, and this in but eight of the 24 elementary and consolidated schools and five of the 17 high schools. An examination of the situation in one of the elementary schools which reported waiting indicated that first-grade pupils shared the use of the toilet facilities with the kindergarten pupils, but even in this instance there was little waiting, and what there was naturally affected only a small number of students. On the basis of the number of installed water closets in relation to the present enrollment of girls, the ratios in elementary and consolidated schools varied from 1:8 to 1:35, with only two schools of the 24 reporting ratios less than 1:25.

During the peak load of utilization, the range, in terms of the ratio of units used to girls, was from 1:9 to 1:70 for the elementary and consolidated schools and from 1:23 to 1:110 for the high schools. Here again there was very little correlation between the ratios for utilization at the maximum period and the ratios for installations.

It was obvious from a casual study of the data that the schools in this study were more than amply provided with water closets and that under existing administrative practices only a limited amount of waiting for use of these facilities was reported by the observers.

Utilization of Boys' Urinals

There was only a limited amount of waiting on the part of boys in their utilization of urinals. The data of the observers indicated that there were in almost all schools an adequate number of these units available and that such limited amount of waiting as did exist may have been occasioned by improper distribution of these facilities. Moreover, it appeared that in a number of the schools there was an unnecessarily large number of fixtures. In the elementary and consolidated schools the number of boys for each unit used at the period of maximum utilization of the school day ranged from 13 to 71. This peak load appeared in the morning, frequently at the recess period. The condition would indicate that a modification of the practice of scheduling recess periods might eliminate the waiting in some of the schools.

In the high schools there was no instance of a school where a considerable amount of waiting was reported, and during the period of maximum utilization of these facilities, the ratios of units used to the number of boys ranged from 1:18 to 1:87. It should be noted that the five largest high schools in the study appeared to have a surplus of from one-third to one-half the total number of units even during the period of reported maximum utilization.

On the basis of these data there appears to be little justification for using a ratio for unit installations in proportion to the enrollment of boys that is larger for elementary schools than for high schools. It must, of course, be constantly borne in mind that the utilization of these facilities and the periods of observed maximum utilization vary according to different administrative practices in the schools which reported the data.

Utilization of Lavatories

Greater variation in the ratio of units to the number of pupils was disclosed in the case of the utilization of lavatories than in the case of other sanitary facilities. In the utilization of boys' lavatories in the elementary schools, in no instance did the period of maximum utilization reported occur during the afternoon, and the range in the ratios for this group was from 1:26 to 1:404. It was evident in the case of several of the smaller elementary schools with only a single lavatory that either the school accommodated a considerably larger enrollment than was anticipated when it was erected or that it simply lacked an adequate number of lavatories for its pupil load.

Extreme variation in the utilization of these facilities was indicated by two elementary schools, each of which had an enrollment of approximately 500 boys and each of which reported ten lavatories in the boys' toilet rooms. The ratios of fixtures to boys during the period of maximum utilization in these two schools were respectively 1:50 and 1:178. In spite of this variation, the school with the lower ratio of 1:178 reported no waiting for use of these facilities, but the other

school, with a ratio more than three times as large, reported that it was necessary for boys to wait in order to wash their hands. Here again was another instance in which administrative practice probably accounted for the difference. Although there was considerable variation in the utilization of these facilities at the peak load period, it should be noted that one-half of the twenty elementary and consolidated schools reported ratios between 1:50 and 1:125.

The observations on the utilization of lavatories by the boys in the eleven high schools indicated a more consistent practice, since the range was smaller. The range of the ratios of fixtures used to boys during the peak load period was from 1:31 to 1:279. Nevertheless, even in the high school with the highest ratio, the observers reported that only a few students had to wait for an opportunity to use these fixtures.

The data on the utilization of girls' lavatory facilities revealed a situation quite similar to that for the boys. In the elementary and consolidated schools the ratios of fixtures used to girls during the period of maximum utilization ranged from 1:21 to 1:418, although only three of the schools reported utilization ratios less than 1:150. Of the eleven high schools only one reported a considerable amount of waiting for the use of these facilities and in this school the ratio of fixtures used to pupils during the peak load period was 1:98. It is significant that the high schools, or more than one-half of the group, had ratios of less than 1:100 and still reported little or no waiting for the use of the lavatories.

An important consideration in interpreting these data that is not revealed by the recorded observations is the possible tendency on the part of pupils who might have to wait for the use of a lavatory to neglect such use upon seeing several pupils waiting to use the lavatories.

Field Comments and Suggestions

In returning the observation blanks, the principals and observers who recorded the data were invited to submit comments. A number of these comments contained interesting administrative suggestions with respect to school practices which might very well be considered by principals in other schools. The more interesting and significant suggestions are quoted below:

Many pupils have favorite fixtures and will wait for them rather than use any fixture that happens to be unoccupied. Cases were also noted where girls, after entering one toilet compartment, would change their minds and leave it to use another compartment.

Some pupils elect to visit toilet rooms when no need exists except the pupil's desire to leave the monotony of the study hall.

It was found that in some schools overloading in certain toilet rooms was noted at times while other toilet rooms were used but little because the toilet rooms were improperly located for convenience or because of inherent shyness on the part of pupils. For example, in one high school, one of the principal toilet rooms for girls was placed directly opposite the entrance to a boys' study hall. The result was that substantially no use was made of that girls' toilet room.

Several schools pointed out faulty planning in not having boys' and girls' toilet rooms near the cafeteria, and especially in not having hand-washing facilities nearer to the cafeteria.

Some requests were made by school administrators that clocks be placed in high school toilet rooms so as to reduce tardiness. In one of the high schools studied, the presence of clocks in the toilet rooms during the period of the study resulted in a substantial reduction in tardiness at classes throughout the day.

Several schools reported that pupils shunned the use of certain fixtures due to failure of the school to supply throughout the day a proper supply of such articles as toilet paper, towels, and soap. Other schools reported the failure of pupils to use certain fixtures because they were old and leaking or because the floor was wet in their vicinity. There were some instances reported of failure to use certain fixtures like boys' urinals because of improper screening from the view of persons in the corridors.

In the directions for recording data of this study, field observers were asked to give special attention to the use of mirrors. In the elementary schools observations indicated that there were only slight differences in the time spent at the lavatories, regardless of whether or not mirrors were placed above them. Consequently the position of the mirrors in relation to these facilities is of little practical consequence as it affects utilization of lavatories. On the other hand, the observations in the high schools indicated repeatedly that, in the toilet rooms of both sexes where the mirrors were placed above the lavatories, these fixtures were used for greater periods of time, by the girls for make-up purposes, and by the boys for combing their hair. The field data suggested that high school pupils of both sexes spent approximately the same time before the mirror. Consequently it appears important that all toilet rooms for high school pupils should be amply provided with mirrors, none of which, however, should be mounted over the lavatories.

The field observations indicated likewise that many high school toilet rooms lacked shelf space on which pupils might place their books and bags when using the facilities between classes. The installation of a shelf approximately 6 to 8 inches wide beneath the mirrors would be very advantageous and would assist materially in the orderly and effective use of the toilet rooms.

A 1947 observation from the principal of one of the high schools studied stresses the need for a small shelf, or box, to be put on the partition inside each toilet compartment in the girls' toilet rooms into which books, handbags, etc. might be placed, obviating use of the floor for that purpose.

In a number of schools the simultaneous overloading of toilet facilities in certain parts of the building occurred while similar units were unused in other parts of the building. This situation could be materially improved by careful planning with respect to the location and adequacy of the facilities. Even in the buildings where adequate facilities were not originally installed for proper utilization, improved administrative practices and planning might remove some of the difficulties. Another aspect of these studies, but one upon which few data are available, suggests the desirability of more adequate attention to the distribution and location of drinking fountains and lavatories

in connection with cafeterias, gymnasiums, auditoriums, and play areas.

Recommendations

In the planning of school buildings to provide for the installation of toilet facilities on the basis of higher ratios of adequacy, it becomes more important than ever that the facilities should be properly located with respect to the flow of traffic and the accessibility to other facilities such as libraries, gymnasiums, corridor junctions, and study halls. It is now rather generally accepted that these facilities should be placed for each sex upon each floor of the building and that the number of facilities on each floor should bear a definite relationship to the pupil capacity of each floor. Additional facilities should be provided for community use, for the cafeteria, and for playgrounds in excess of thos determined by ratios to pupils and should, of course, be properly located with respect to these services. The installation of such facilities should also take account of the maximum enrollment to be housed in the building at a single given time.

The field data collected in this study disclosed wide variations in the ratios of installations and maximum utilization and might be cited as evidence in the defense of existing regulations and code requirements. On the other hand, if school authorities will accept the median ratios of existing facilities as indicative of a more satisfactory relationship of the proper number of fixtures than present subjective opinion asserts, the number of units necessary to accommodate pupils adequately might well be reduced.

Based upon the waiting time and the ratios of maximum utilization as revealed by this study, the following ratios appear to be adequate and reasonable:

	Ratio
Girls' water closets	
Elementary school	1: 35
Secondary school	1: 45
Boys' water closets	1:100
Boys' urinals	1: 30
Lavatories (washbasins)	
Elementary school	1: 60
Secondary school	1:100

When elementary and high school grades are housed in combination within a single building, the standards for sanitary facilities should be the same as those here proposed for elementary schools. The above ratios are recommended only on the condition that not less than two fixtures of each type be installed in each toilet room. This qualification is suggested in order to meet the pupils' needs when a single fixture may be out of order and to provide adequate facilities in the smaller schools.

This article is substantially extracted from the final report. The members of the School Plant Research Committee spent considerable time in re-evaluating the field data and arriving at the above recommendations. Those interested in the details of the study may wish to obtain from the American Council on Education, Washington, D. C., a copy of the complete report entitled, *The Utilization of School Sanitary Facilities*, Series VII, No. 3, Volume VI dated June, 1942 (cost 10 cents). Dr. George F. Zook, President of the American Council on Education, in his Foreword to the Report states that already considerable interest had been manifested in the findings and recommendations of this study, and that it was earnestly hoped that its recommendations would be incorporated in the building standards of a considerable number of state and local public school systems. Within the past two years these ratios for water closets and urinals have been adopted as minimum requirements by the National Council on Schoolhouse Construction in its tentative Guide for Planning School Plants and by the State Education Department of New York in its 1947 pamphlet on Sanitary Facilities of School Buildings.

Its determination of a more economical number of plumbing fixtures needed in a school building will be of material assistance to school boards and architects who are facing the serious problem of providing new school housing and modernizing old with limited budgets, yet in the face of ever mounting building costs. The money retrieved from what otherwise would be a "frozen" investment, can well be used to provide better or more ample instructional facilities.

HEAT FROM THE EARTH

By GEORGE H. BUSH

School Building Specialist, Purdue University, Lafayette, Indiana

Mr. Bush has had wide experience in education, industry and government since his graduation from Kansas State College in 1922. He has an M.S. in Education from Indiana University and has done advanced graduate work in public school administration at Northwestern and Teachers College, Columbia. During the last war, he was consultant on building maintenance and operation for the War Department, and has been asked to serve as consultant on school buildings for occupied Germany for the Civil Affairs Division of the U. S. Army. As Custodian Counselor at Purdue, he became interested in the material contained in this article.

ALL THROUGH the ages the sun has provided heat to produce all sources of fuel. These in turn have been used to provide comfort in buildings or in civilized areas where heat is necessary.

In this transfer of heat from the sun to the earth, the earth's surface acts as a sponge in absorbing the heat sent out by the sun's rays and holds the heat, in general, at a fairly constant rate. Experiments have shown that the earth's surface contains considerable heat at practically any period of the year. The amount varies according to the type of soil conditions, the depth from the earth's surface and the amount of water content or minerals that are present.

The water surface areas on the earth's surface are another source of heat which is not as pronounced as the earth's surface, but is nevertheless present to aid in holding the sun's heat that is sent to the earth. Since about five-sevenths of the earth's surface is covered by water, the amount of heating or cooling contained by the water area has a great effect upon the total amount of heat that is present for the whole earth environment.

Conditions of Comfort

In any basic consideration of heat or heating conditions, whether from the earth or from any other source, it is always well to consider the conditions of comfort that are necessary to make the heat as usuable as possible or to apply it in such a way as to make for the most satisfactory comfort conditions. Experience down through the ages shows that there are three basic factors which affect comfort conditions for the human race: temperature, turbulence, and humidity.

Temperature in itself is not the most important part of "conditions of comfort," but is perhaps more easily recognized by the most people. A comfortable temperature can be either high or low, depending upon the other factors that enter into the comfort conditions. Temperature variations all the way from 65 to 90 degrees Fahrenheit may be comfortable, depending upon the amount of turbulence and the amount of humidity that is present.

The question of turbulence, or air motion, is also important in determining the amount of comfort experienced by an individual under any environment. Regardless of whether temperature is relatively high or low, discomfort is present unless some air motion accompanies the temperature conditions. In general, a reasonable turbulence of 100 to 150 feet per minute provides comfort with the proper temperature in the best environment.

The third factor that enters into the conditions of comfort is the matter of humidity in the surrounding air environment. If hot air is the medium of heat transfer to the area to be heated or cooled, the control of the water content is a very important factor. Here again water content or relative humidity is only one factor to be considered, but it must be evaluated in relation to the temperature and the turbulence that is present. In general, if the temperature and turbulence are properly controlled, the relative humidity necessary for best comfort varies from 25 to 50 per cent depending upon the other conditions. If the amount of water vapor is too high there will be objectionable deposits made upon the surrounding objects or areas; while on the other hand, if the amount of water vapor is too low, there will be a definite drying out of the "mucous membrane" in the respiratory tract of the individuals present to induce colds or other respiratory diseases that are not only objectionable, but detrimental to health.

In summing up the conditions of comfort it is well to consider all three of the factors mentioned above as well as the elimination or control of dust or dirt that is present in the breathing zones surrounding the individuals. In general, the breathing area surrounding individuals must be considered in relation to, first, the activities of the individuals; second, the relative environment of the individuals with relation to outside conditions; and third, the variations necessary to meet the need of a group of individuals. Careful

study of all factors must be taken into account to work out the most favorable conditions of comfort to surround the individuals in any environment.

Application of Earth's Heat

The heat content present in the earth's surface has been found to vary according to various locations and the various geological formations that are present in the earth's surface.

One source of heat in prevalent use is that of hot water deposits found in various areas fairly close to the earth's surface. This is particularly true in sections of the United States and Europe around the hot spring areas where hot water can be piped directly into buildings and circulated to radiators to give the proper heat. This procedure is followed in Iceland perhaps more than in any other area, because the hot water supply is relatively close to the earth's surface and is present in large quantities. The only expense involved is the cost of piping and a pump to circulate the hot water from the earth's deposits through the heating medium of radiators or other devices.

Another form of the earth's heat is steam deposits, particularly in Italy, which can be tapped and pumped through the earth's surface to be used in buildings or other areas. Steam deposits provide a good source, but are not too general throughout the earth's surface.

The use of a heat pump as shown by Figure 1 is a third means of obtaining heat from the earth. The heat pump, in general, is a device which uses the refrigeration principle to tap a source of heat either by

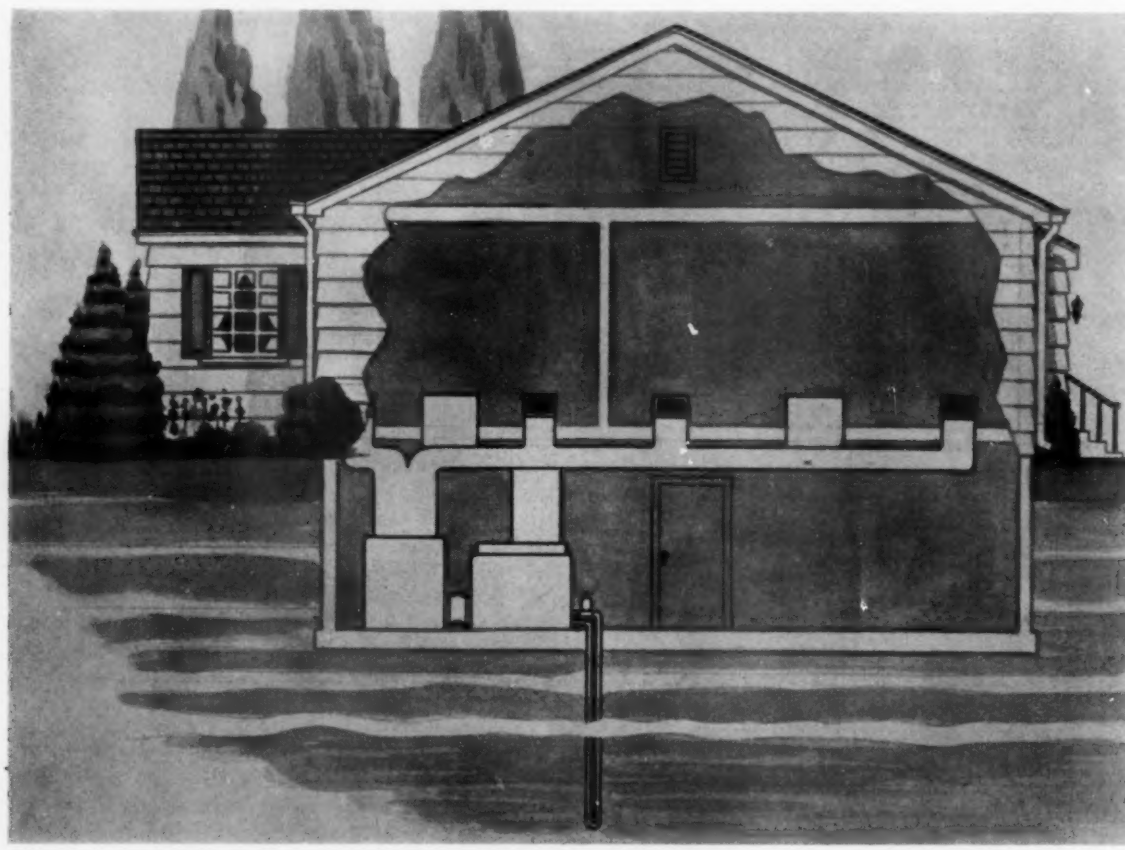


Figure 1.
Cross-section showing pump installation.

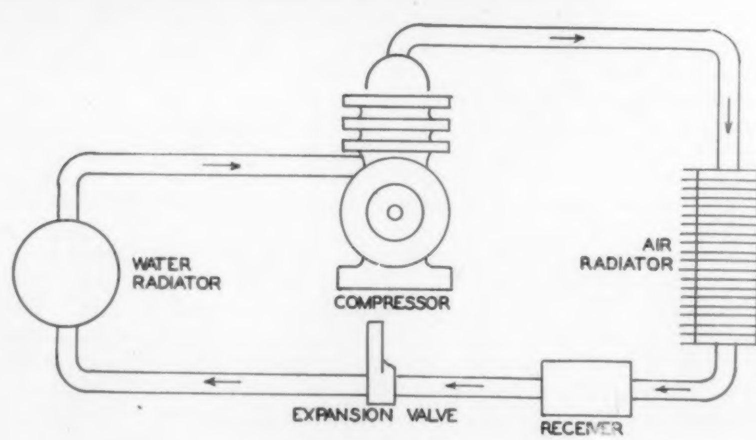


Figure 2.
Diagrammatic sketch with basic parts labeled.

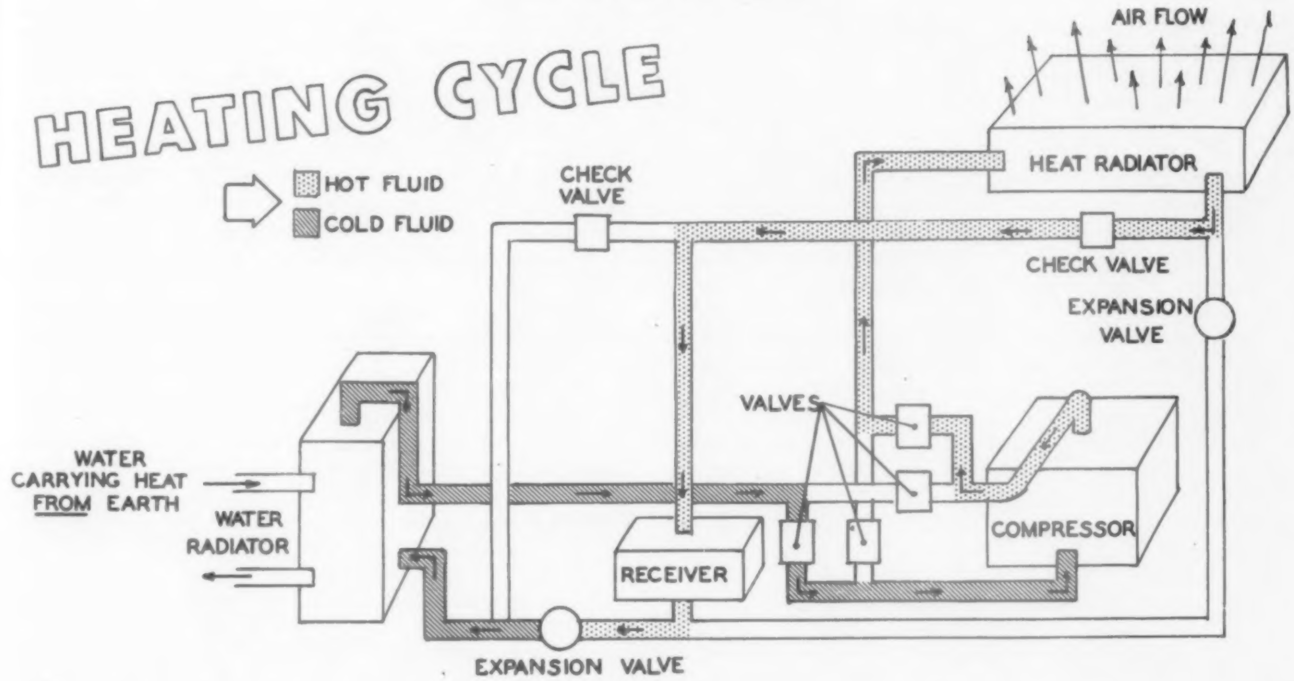


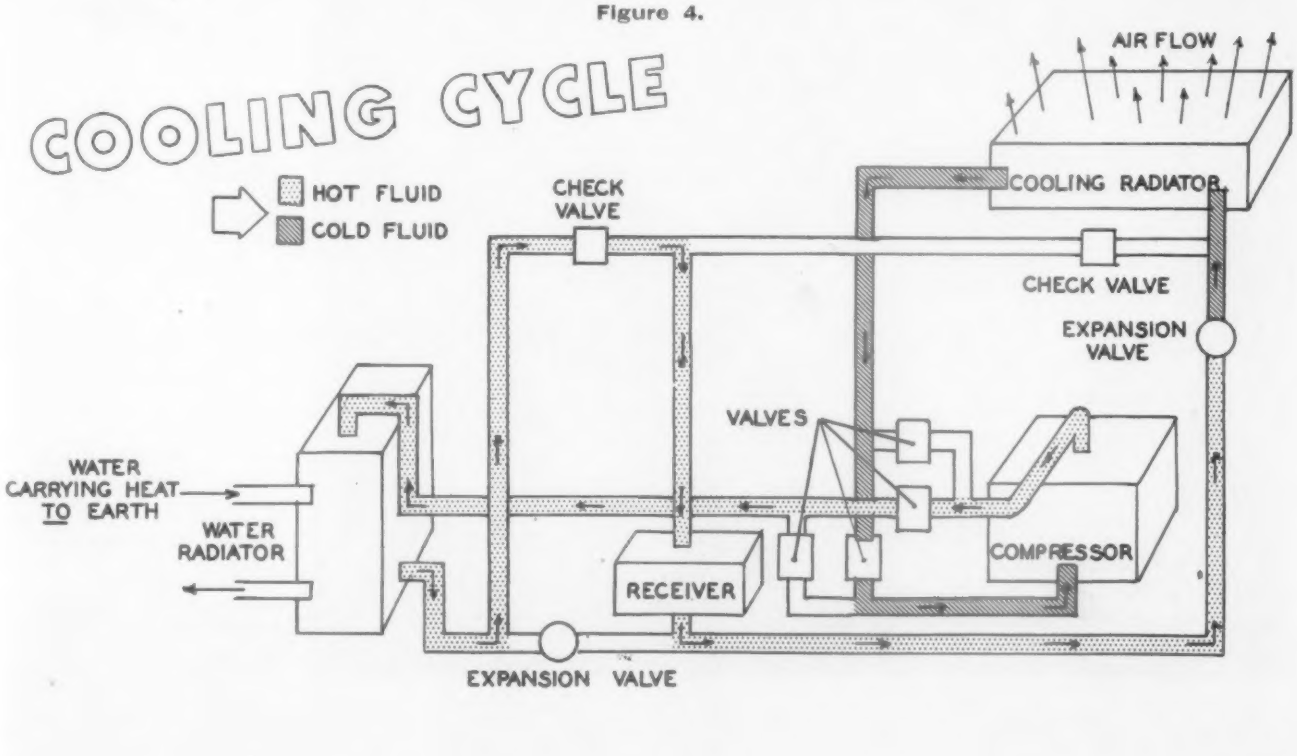
Figure 3.

circulating water through a well or through coils of pipe laid in the ground to bring the heat units from the earth's surface to a water radiator and then introduce it through the refrigeration system as will be discussed in the next sections.

The Heat Pump

The basic design for heat pumps is shown diagrammatically in Figure 2, with basic parts labeled. The heat pump is a refrigeration installation working in reverse which makes use of the heat transferred from the earth's surface to the water radiator that is inserted in the refrigerator cycle between the expansion valve and the compressor. When the heat from the earth's surface is introduced into the refrigerating cycle, it is utilized in the part of the cycle from the compressor to the expansion valve, although the refrigerant may have a temperature varying from 35 to 50 degrees Fahrenheit. The heat of compression may raise the temperature from 50 degrees to 180 degrees which is utilized as a fan circulates the air in the building through the heat emanating from the air radiator. The advantage of using the heat pump principle of heating or cooling is that this can be done

Figure 4.



automatically by proper temperature controls. Thus the device operates as either a heating or a cooling device, depending upon the needs.

The variations possible with the heat pump are shown definitely by Figure 3 and Figure 4, using basically the same type of equipment. When properly controlled by valves and by-pass arrangements, the heat radiator can be used either as a heating medium or as a cooling radiator. In either case, the earth's surface is used to bring the heat to the water radiator or to carry it away if the conditions require it. Refrigeration and gas manufacturing plant engineers, as well as heating and ventilating engineers, have been working on the heat pump principle for several years and find that it is possible to use it in various applications.

It might be well to list some of the precautions necessary to use the heat pump properly. These are shown graphically by Table 1 which lists the heat pump basic requirements. The main problems to be considered are the type of construction, the outdoor conditions, the basic electric rate for electric energy, and the variations in conditions that will be required relative to heating and cooling.

The Heat Pump for Schools

Up to the present time the use of the heat pump has been primarily confined to office buildings and homes, but there is no particular reason why it could not be used in schools as well as in any other type of building.

Even though schools throughout the country are built in environments where the temperature range goes from minus 20 degrees Fahrenheit to plus 120 degrees Fahrenheit, in addition to variations in wind conditions, moisture content, and the amount of dust particles in the air, fundamentally, the following requirements are necessary in any school application: heating, cooling, hot water supply, and refrigeration.

It may not be possible to provide all four of these

TABLE I

HEAT PUMP BASIC REQUIREMENTS

1. Sturdy construction
2. Adequate insulation
3. Minimum glass areas
4. Glass areas sealed
5. Double thickness glass
6. Minimum heat loss construction
7. Reasonable cooling needs
8. Intelligent operation

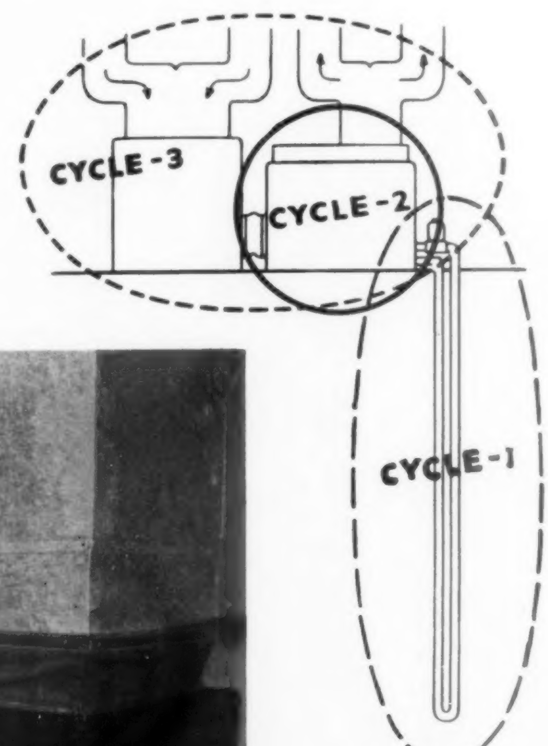


Figure 5.

Mechanics of the heat pump are basically those of the ordinary household refrigerator. Three independent cycles, as shown above, are: (1) water or ground circuit absorbed heat from the earth; (2) refrigeration circuit transfers heat to the air stream and to a higher temperature level; (3) air stream transports heat to or from the space to be conditioned.

variations in any particular school installation, since such provision would have to be determined by economic factors of practical nature in the particular environment. However, there is every possibility that the heating and cooling requirements could be definitely provided by a heat pump installation. The heat pump would be an ideal arrangement to use in the small isolated community school where a minimum of care or operation time would be necessary to keep the equipment operating. Schools equipped with the heat pump installation would be practically automatic in operation and would require very little maintenance or operation in providing the heating or cooling requirements.

Conclusions

The heat pump will perhaps not be a "panacea" for any environment, regardless of where it is situated; but it could be considered if it is necessary to provide heating and cooling—as would be the case in practically any environment in the United States. From the experiments already made and the installations that are already in use, as shown by Figure 5 and others, there is every indication that we may soon expect a refinement of the heat pump, adaptable to almost any situation in the country.

One of the biggest advantages of the heat pump is that full automatic control is provided to take care of the changing conditions as they arise. In many environments there is a change or variation from heating to cooling requirements throughout a 24-hour period. This means that the heat pump is ideal to handle this condition because of the automatic nature of controls provided with it.

Another item that definitely enters into the consideration of the heat pump is that of providing a clean environment which eliminates smoke, dust, or other annoying conditions in the atmosphere. At the same time the heat pump definitely saves space in buildings which now contain fuel bins, pumps, boilers and other apparatus requiring considerable space for their housing.

The use of a heat pump in most cases would require a re-evaluation of the building codes to take care of the items shown previously under Table 1. Buildings must be constructed to insure lowest heat loss conditions in order to have the heat pump applicable to most situations.

Finally, it will be necessary to have a lower electric rate in most areas to make the use of a heat pump economical. Experience has shown so far that the electric rate must be no greater than one cent per kilowatt hour if the heat pump is to be practical economically. The cost of operating the heat pump must be considered in making it universal for school use.

Note—Illustrations furnished through the courtesy of The Muncie Gear Works, Inc., Muncie, Indiana, manufacturers of "Marvair" Heat Pumps.

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HOMEMAKING PROGRAM DETERMINES BUILDING PLAN

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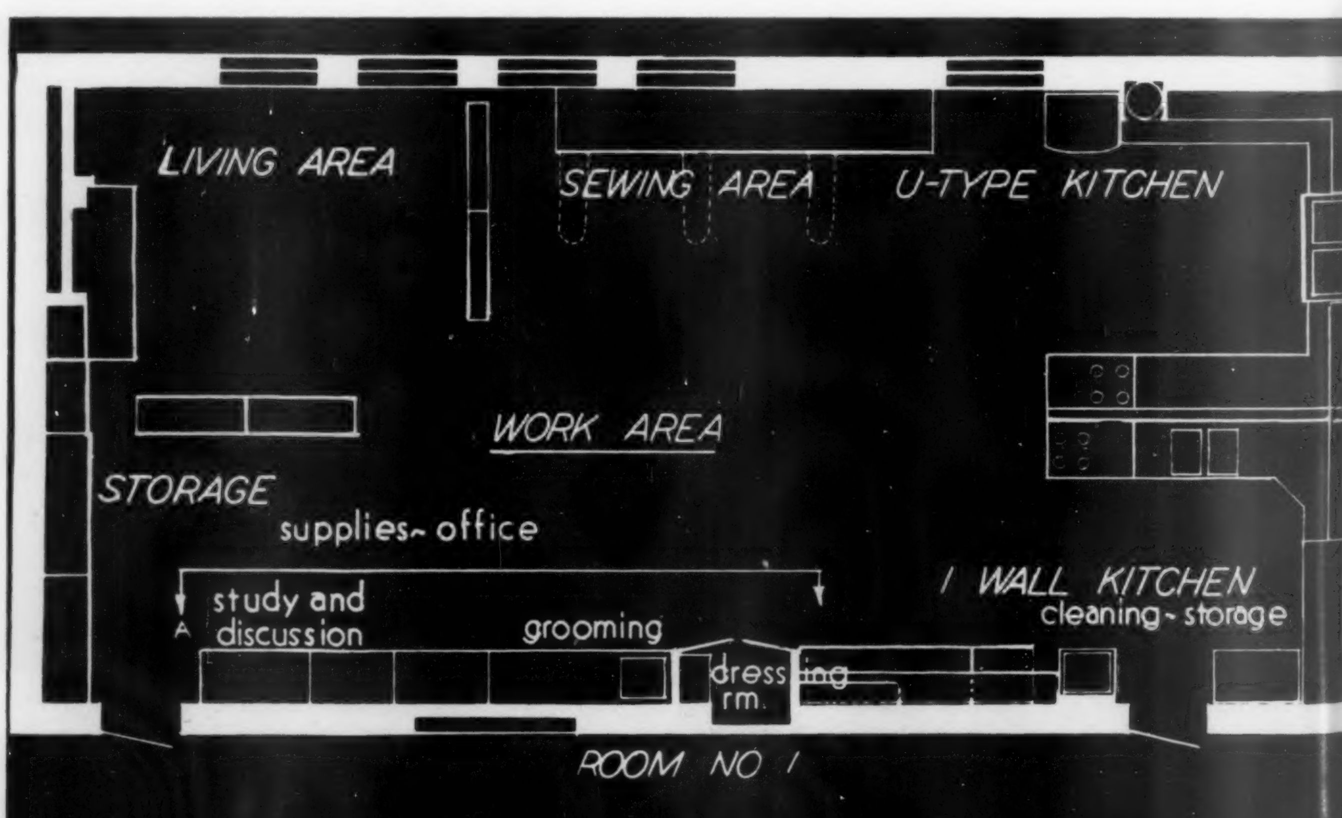
THE traditional procedure of attempting to change the curriculum but to leave standardized classrooms intact has been abandoned in the Pasadena Secondary Schools. The procedure now used involves, first, a planned school program designed to provide adequate educational experiences for all children from kindergarten through the fourteenth grade; second, curriculums designed and coordinated specifically to implement this program; and finally, physical equipment and room design best adapted to the achievement of the accepted purposes and curriculum plans.

Such a procedure entails a long series of conferences and study groups. First, Board of Education approval of the total program must be secured, but only after the Board has been made fully aware of what the proposed program involves in teaching personnel, materials, equipment, and building. Second, teachers must be organized into study and planning groups, with supervisors, principals, and administrative officers serving as advisors and consultants. Finally, the building department can design rooms which will provide adequate housing for the program and which will be approved by the planning groups.

To operate within this framework of principles and procedures is an extremely satisfying experience. There are no super-imposed ideas or plans, no last-



minute delays due to unknown administrative or budgetary limitations, no fear of a veto or of accusations; for everyone concerned with the program has participated in the process of developing purposes, curriculum, and building plans.

The following detailed account of the revision of homemaking curriculum and building plans is an example of the Pasadena plan in action. It includes the work of city-wide study groups and specific plans for remodeling the department in one school.

Study Groups

Homemaking teachers of the city organized a study group to consider ways to improve the services of homemaking education. Investigation of current literature in home economics and general education, and defining local problems served as guides in charting activities. The immediate needs seemed to be to clarify our own philosophy of homemaking education, to interpret our program to the public, and to invite participation of members of the community and school personnel in planning and implementing the curriculum.

Three types of group meeting were used to help resolve these problems. Volunteer committees of teachers investigated and reported findings on specific problems of homemaking education. The public was invited to a series of four Family Life Institutes, each program of which was designed to interpret some phase of homemaking through exhibits, demonstrations, and speakers. Fathers, mothers, homemaking students, teachers and student teachers from a nearby college, homemaking teachers, and representatives from secondary school administrators and the Board of Education participated in a Homemaking Patron-Student-Teacher Study Group to discuss the question, "What should every individual know in order to be an effective family member?"

Among the tangible outcomes of these group activities were a statement of purposes of homemaking education in Pasadena, defining areas of activity and suggesting problems within each area as a basis for developing curriculum, and a request by the junior high school principals that the department in one school be remodeled to provide facilities for a complete program in homemaking to serve as a guide in planning other departments.

Purposes of Homemaking Education

The general purposes of homemaking education in Pasadena, as defined by the study groups are:

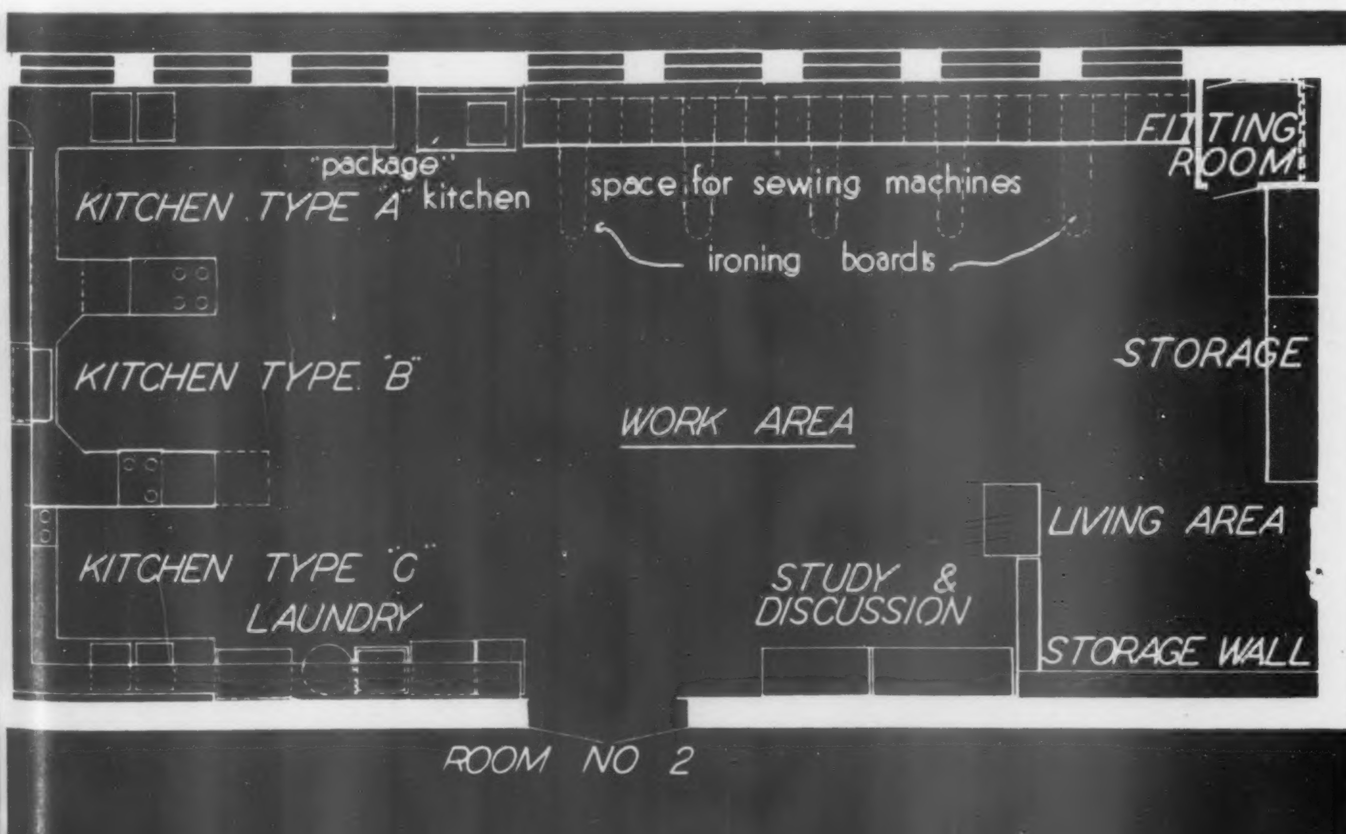
1. To help young people live effectively in their homes now, and to set values for establishing and maintaining homes of their own.
2. To help meet developmental needs of young people in the areas of child care and guidance, clothing, food, health, housing, family relationships, and home management.
3. To help meet interest needs of young people through planned school, home and community experiences, and through effective use of audio-visual aids and the literature in the field.
4. To help young people and adults gain knowledge of and experience with the results of modern technological findings as applied to problems of home living.
5. To help young people meet their personal problems in growth toward independence, in educational planning, and in the choice of and preparation for a career, including the career of homemaking.

Preparation for the Blueprints

The principal and homemaking teachers of the junior high school which was selected for remodeling met with the Board of Education. They presented an

Proposed Homemaking Rooms, Washington Junior High School, Pasadena

Frederick Kennedy, Jr., Architect



outline of the total school program in homemaking education and a proposed plan for remodeling the present rooms to meet the needs of the program. The Board agreed to those plans through allocation of building funds and the employment of an architect.

Many individuals and groups have been involved in applying the findings of two years of curriculum study to building plans. Students have drawn plans and made scale models of various sections of the rooms, and have participated in surveys to determine types of equipment to be installed. Homemaking teachers have checked work and storage areas in terms of curriculum experiences and classroom organization. Supervisors of special departments have advised with us on providing adequate facilities for use of visual materials, creating an artistic homelike atmosphere, and providing flexibility in use of rooms.

The assistant superintendent and his staff in the business and building departments have given much time and effort in clearing details and giving constructive advice. Groups of parents, supervisors and administrators have checked preliminary and final plans to see that provision is made for all activities and that decorations and equipment are appropriate for home standards of the community. We have conferred with custodians on floor plans and finishes in terms of cleaning and care. The architect has been most cooperative in taking time to learn the basic principles on which we are working, in making changes suggested in each group meeting, and in supplying technical advice.

The final plans have been approved and we have great hope of moving into the new rooms by June 1, 1948. Although we cannot evaluate experiences in the finished rooms, we feel justified in telling our story thus far. It is a story of developing a pattern for continuing cooperative action in working toward our purpose: the purpose of providing school, home, and community experiences which will contribute to improvement in the quality of home and family living in our community.

Factors Which Influence the Homemaking Program

Although we start thinking in terms of student needs and interests, there are school policies and community conditions which influence the way in which these needs can and must be met.

The Pasadena City School System is organized on a kindergarten, 6-4-4 plan, plus adult education. This means that we must accept responsibility for the total school experience of the great majority of our students who terminate their formal school training at grades 12 or 14.

The junior high school curriculum is based on such principles as exploration, experimentation, and guidance. Homemaking is required of all 7th grade girls. Elective homemaking courses for boys and girls vary in the junior high schools and junior colleges, as do terminal and college preparatory programs. Adult programs are based on specific requests of prospective class members.

Although national surveys rate Pasadena as a wealthy city, there are differences within the five secondary school districts which must be considered in planning a functional program for each junior high school.

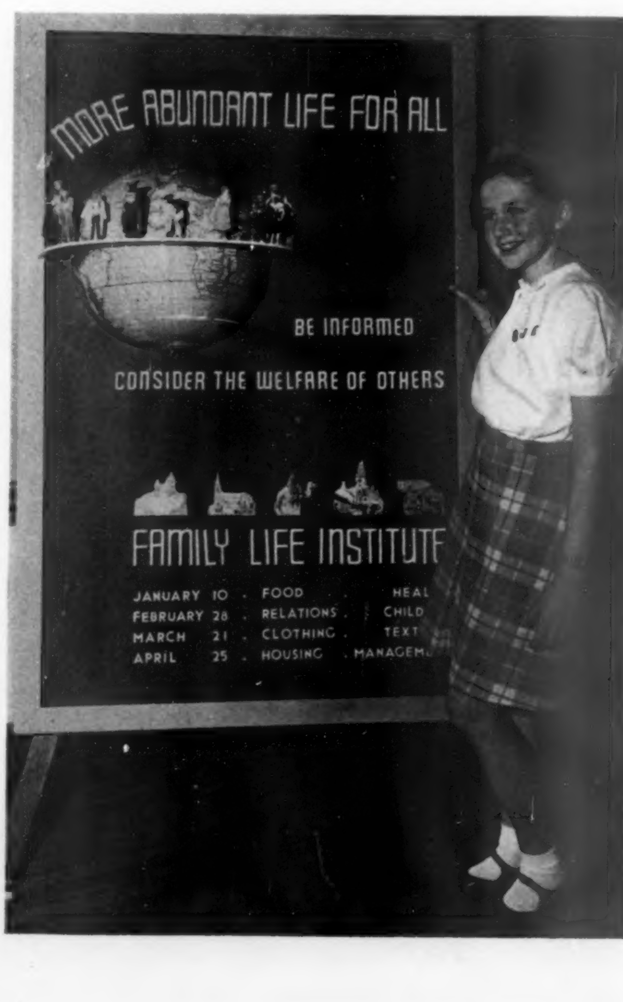
Washington Junior High School district houses Caucasians, Negroes, Mexicans, and Japanese. Income levels range from high-middle to low brackets. Occupations of parents include professions, business, skilled and unskilled labor. Dwellings vary from well-furnished modern homes to scantily furnished shacks. The majority of houses are single-family units and have some yard space. Over-crowded housing conditions are typical of the whole metropolitan area.

Within the district there are three public parks, a branch of the public library, three supervised playgrounds, five churches and two motion picture houses. There are "corner groceries" within walking distance of most homes and two small shopping centers. The main shopping districts of Pasadena and Los Angeles are easily accessible. Public transportation services the area fairly well, and most families drive cars.

Family life in the community is built on many patterns, from the traditional closely-knit family circle, to those homes in which the family rarely gathers as a group. Size of family, number of broken homes, and number of families including grandparents or other relatives, very nearly follows the normal curve of distribution.

Home responsibilities of junior high school pupils seem to be affected by the attitude of parents toward growth and development of children and whether the mother is employed outside the home. Reports

Family Life Institutes help interpret the homemaking program to the community.



of home activity include: no responsibility but occasional help; appropriate participation and shared responsibility; and complete responsibility for some routine housekeeping procedure.

Rapid population increases due to immigration and high birth rate, city zoning ordinance variations, and shifting economic conditions tend to change some community conditions from time to time. We try to note trends and to adjust the program accordingly.

Homemaking Experiences

In order to help develop a concept of the complexity of home and family living, we have defined homemaking as "a family living in a home, carrying on activities resulting in values to each individual; the whole being influenced by environmental factors which are more or less within control." This concept has been graphically told by means of a chart featuring a series of rotating concentric circles. These can be moved to present a number of different relationships, indicating how one function or need impinges upon another in daily home life. This chart is used by teachers and students in evaluating all school, home, and community activities carried on through homemaking classes.

The seven areas of activity are described as child care and guidance, clothing, food, health, housing, family relationships, and home management. The personal values of home and family life include harmony and happiness, companionship and love, privacy, self-expression, culture and tradition, moral and spiritual values, beauty, and status and security.

Experiences in each area are diversified, all areas are interrelated, and all activities are evaluated in terms of knowledge and skill, personal values, and environmental influences. For example, a unit on child care and guidance may include experiences in care of infants, study of principles of growth and development, observation and supervision of young children at home or in a nursery school, planning and preparing food, planning and making clothes, selecting and making toys and investigating the contribution of toys to learning, planning a child's room, and discussion of the influences of growing children on family relationships.

Learning to bathe the baby is a problem in child care, but it involves consideration of good health habits and practices, housing, adaptation to provide space for care and storage of baby's equipment, time management to provide for baby's schedule, and family relationships with such community organizations as the Red Cross, Visiting Nurse Association, or the Well-Baby Clinic. This added skill provides opportunity for self-expression and for status and security in the family group for many girls whose families include young babies.

The needs and interests of individual class members, identified through teacher-pupil planning, determine the particular activities included in any unit, but facilities must be available for all experiences which can be anticipated. In terms of building plans, the problem is one of providing adequate work and storage space.

Classroom Activities

Several types of classroom activity have been indicated. Because of the variety, it seemed important to make the following checklist of activities in order to provide proper space and equipment.

Activity	*Space and Equipment*
Study	Tables and chairs for 30 pupils Bookcases and files Equipment and supplies used in all areas of home activity
Discussion	Tables and chairs Chairs for informal groupings Chalk board Space to display posters and other illustrative materials
Preparing notebooks and posters	Tables and chairs Long work counters Art supplies Magazines for clipping Display space for posters Individual storage space for work
Exhibits and demonstrations	Display case and bulletin boards Demonstration table with lighted mirror Art supplies Equipment and supplies used in all areas of home activity Special collections of equipment and supplies
Practice and experimentation	Typical home equipment and supplies for all areas of activity
Skits and plays	Area which can simulate a stage and space for an audience
Movies and still films	Pull-down projection screen Adequate provision for darkening and ventilating room for films Space to arrange chairs for clear visibility Electric outlet for projectors Projectors and films—movie, still, slides, balloptican available on request.
Recordings	Electric outlet Comfortable seating space Record player and records available on request
Construction	Sewing equipment Woodworking equipment—a simple home type Art supplies Supplies for art needlework
Open house, flower shows, fairs	Exhibit space to include glass display case, open shelves, bulletin boards, table-height counters Fabrics and paper for backgrounds Flower containers and accessories Typical household equipment and supplies Space to arrange loan exhibits of equipment and supplies Electric outlets
Parties, meetings for class, school, and community groups	Complete food service for 60 Tables and chairs for 60 Equipment for patio living and entertainment Barbecue equipment for patio Furniture and equipment for family meals Furniture and equipment for simple party refreshments

Planning Activity Areas

In view of the purpose of homemaking education, the units of work, and the types of activity, it seemed logical to make a floor plan which was comparable to a home, and still, one which would provide working space for a class of 28 to 30 pupils. The plans were

Bathing the baby is a part of the child care course which includes health problems, storage of equipment, time management, and relationships with community agencies. At left—food demonstrations are part of occupational training. Below—the patio adjoining the homemaking rooms provides a setting for flower shows and barbecues.

drawn by areas, and later fitted into the dimensions of the rooms. These areas consist of kitchen, laundry, cleaning storage, living and dining space, sewing supply storage and work space, clothing storage, grooming center, display and exhibit space, bookcases and files, woodworking bench, general storage areas, general work space, and areas for gardening and outdoor living.

The next step was to check these building areas in terms of the curriculum. Again charts were used to outline experiences, resource materials, and work and storage areas needed for at least one problem in each unit of work.

Space for storage was limited, but that is rather typical of homes in our community where attics and basements are rare. Storage wall-type cabinets, with adjustable shelves, helped solve the problem. We have planned additional cabinets above the 7 foot height for storage of supplies which are not in use. A custodian with a ladder will be needed for changing supplies from permanent to current storage cabinets, but that inconvenience seems justified in order to have more free floor space.

To conserve space and money, equipment and special areas must serve multiple purposes. A box couch with separate mattress and cushions serves as a davenport in the living area, and as a bed for arranging a bedroom, or for practicing bedmaking or home care of the sick. Three low book cases and a desk are partitions for the living area, heavy enough to serve as walls, yet movable so that the area may become a living room, a combination living-dining area, a one-room apartment, or a corner of the large room.

We believe that application of the principle of multiple use is one way in which we may meet the needs of all income levels in our school community. Furnishings will be attractive as well as functional and they are planned as resource materials for classes of junior high school pupils and adults who will use the rooms.

Selecting Equipment

In view of the fact that we are a "gadget-minded" public, and that modern technology has provided an ever-increasing supply of beautiful and functional equipment, it was difficult to keep our feet on the ground in selection of furnishings. Our points of reference in establishing basic principles of selection were the Purposes of Homemaking Education in Pasadena, and the patterns established by the Sloane Foundation Research and the Youth Adjustment Program for meeting individual and community needs.

Information was secured through visits to homes, conferences with parents and students, surveys of equipment used in homes of our students, reports from utility companies, and extensive reading and shopping to collect comparative data on available makes and models.

Younger students indicated a desire for some equipment such as they have at home as a basis for security in practicing at home and at school. Patrons requested an opportunity to examine and experiment with new equipment installed for use as a basis for selecting home replacements and new equipment. The following survey on sewing machines is typical of findings in regard to all home furnishings and equipment.

Of 160 homemaking students asked for information on types and makes of sewing machines in their homes, 31 per cent did not own a machine. Of the machines reported, 74 per cent were of one make, 15 per cent of another, and the remaining 11 per cent represented eight makes. Thirty-eight per cent of the total number were treadle and 62 per cent electric.

UNIT: Child Care and Guidance — PROBLEM: How do toys contribute to learning?

Suggested Experiences	*Resource Materials*	*Work Area*	*Storage Area*
Examine exhibit of toys, classify as to age group, contribution to learning, safety, value	Exhibit of toys Books and magazines Wall charts Posters Magazines for clipping Films, screen projector	Display cabinet Study area Demonstration table Bulletin board Work area Discussion area Visual projection area	Bookcases Magazine racks High storage cupboards Tote drawers Files Roll-up projection screen
Record findings in source book	Note books Typewritten unit Plans and outlines Paste, scissors Rules, colored pencils	Work area Study area Discussion area Office and supply area Work counter in sewing area	Storage cases behind chalk board General storage cases Tote drawers Files
Make a toy for a child of selected age	Patterns, books Magazines Sample toys Fabrics, wool bats Lumber, paint Woodworking bench Paper, paste Scissors, pencils	Sewing area Display case Storage cases Woodworking bench Work area	Storage case Work bench Sewing area Tote drawers Files Bookcases
Prepare an exhibit or demonstration to summarize unit activities	Selected materials used and made during unit Fabrics and paper for backgrounds	Office area Display case Bulletin board Demonstration table Work counter in sewing area	Tote drawers Storage cabinets

Five makes are on sale locally, and are available in standard or de luxe, electric or treadle, cabinet or portable models. An informal check on current sales reports showed a somewhat different proportion in makes of sewing machines being delivered from that reported in the school survey. These data were collected informally and only to provide a basis for selection. In consideration of equipment in use, of that available, of current sales trends, and of the school's responsibility to provide potential consumers with unbiased information, we have established "inventory percentages" for each make and model of sewing machine.

A summary of findings resulted in one guiding principle—that our furnishings and equipment must represent a wide variety of makes, models, and cost. This means that our laundry equipment should include a set tub and wash board, wringer type electric, partially automatic, and fully automatic washing machines. Ranges should be gas and electric, apartment and standard size, and include both standard and deluxe models. Such diversity of equipment will provide opportunity to experiment with the newest devices, and to set standards of ownership on the basis of values to the family of particular equipment or features in relationship to cost.

Fitting the Pieces Together

When we reached this stage of our planning, we felt that we had many loose pieces, all with strings attached. Our problem was to join the pieces of activity areas and equipment with the strings of purposes of education and building codes to create an adequate environment in which to develop knowledges, understandings, and skills necessary to establish and maintain a home.

It was possible to move from the second floor to rooms on the first floor which adjoin a patio and the main and service entrances to the building.

Two rooms are adequate for our present enrollment, so the first problem involved types of activity to be carried on in each room. Since homes are operated as a whole, with each type of activity interrelated with many others, it seemed logical to plan each room for a general program in homemaking. Equipment, furnishings, and floor plans will differ in order to provide the variety which we need, and the teachers will plan exchanges so that each room and the patio are available to classes as needed.

It will be possible to arrange each room as a five-room house or as a banquet or assembly hall. Four kitchen units and extra sewing equipment and storage in one room make it the center for intensive study of problems of food and clothing. The other room will house permanent installations and storage for equipment needed in long-term units on child care and guidance, house furnishing, home nursing and laundry.

A set of general principles was formulated for the use of the architect, and for our own use in checking plans. These too are the result of group discussions and are included in detail.

1. Homelike appearance in color, arrangement, and furnishings through: (a) home-type entrance doors; (b) home furnishings—no "school models" or "schoolhouse brown" finishes; (c) color and finishes in each area suitable for the activity but the whole subtly blended into a pleasing room; (d) an electric fireplace in one living area and storage-wall and extra window accessories for the other; (e) insofar as possible, activity areas to be placed in the same relationship as rooms in a house.
2. Unit kitchens each different to include: (a) typical home plans, such as U-type, L-type, 2-wall type, an apartment "package" kitchen, kitchen-laundry, kitchen-dinette, and kitchen-service porch combinations; (b) one modern all-electric kitchen, and one metal unit; (c) variety in cupboard arrangement; (d) variety in floor and counter finishes.
3. All areas open for easy supervision and accessibility for demonstrations.
4. Partitions not higher than 40 inches and, where possible, movable to provide flexibility in use of the rooms.
5. Adequate storage space through use of adjustable shelves, but no space consuming walk-in storage areas.
6. Adequate display space for visual materials and exhibits through lighted display cabinet, adjustable cupboard shelves, and tackboard on cupboard doors.
7. Provision for using movies and films through pull-down projection screen and dark curtains.
8. Adequate light and ventilation for day and evening use and when showing films.
9. Light, sturdy, and attractive chairs and dropleaf tables which can be moved easily to provide individual, small group, or large conference work arrangements; and tea room or banquet settings.
10. Except for kitchens, retain hard maple flooring and apply easily kept floor finish.

These rooms will be, truly, the visible evidence of a community program in home and family living; conceived in the interest of improved services of homemaking education and nurtured by the cooperative efforts of patrons, students, teachers, and school officials.

We feel, however, that we have only opened the door to exciting adventure. Continuing and intensive studies are needed to define and help resolve the needs of youth and adults. The foundations are laid for effective community-school cooperative planning and we must do our part to make this relationship enduring.

Our building is planned for flexibility, and we now propose that neither the environment nor the curriculum will become crystallized, but rather, that it will be an on-going process dedicated to the purpose of improving the quality of home and family life for all boys and girls and men and women in our community.

STUDY OF JUNIOR COLLEGE BUILDING NEEDS IN CALIFORNIA

By DOW PATTERSON

Division of School Planning, California State Department of Education, Sacramento

A native of Texas Dow Patterson received his A.B. degree from Hardin-Simmons University and the Master of Science degree from the University of Southern California. At present he is a candidate for the degree of Ed.D. at the University of California at Los Angeles. Prior to his affiliation with the California State Department of Education Mr. Patterson was connected with public schools in Texas as teacher, principal, and superintendent and in California as an instructor in educational fields.

THE postwar growth of junior college enrollment and the increase in the number of junior colleges throughout the United States have brought more clearly into focus the need for giving greater consideration to planning the junior college plant. The fact that the National Council on Schoolhouse Construction is holding its annual convention in California in the Fall of 1948 with Charles Bursch of the California State Department of Education, Division of School Planning, as its president, has doubtless been a contributing factor to the interest in the field in this state.

Interest shown by junior college administrators, together with their recommendations and the recommendations of Dr. Bursch, prompted Basil H. Peterson, President of the California Junior College Association, to appoint a committee known as the Building Program Committee of the California Junior College Association to study the problem of junior college housing.

California presents a fertile field for study of the problem because at the present time a number of institutions in the state are in the process of building junior college educational plants, or adding to their present ones. Of these institutions many are utilizing and re-converting buildings received from the Federal Government. Still others are in the process of converting plants formerly used for other purposes into junior colleges. Chief among these are Orange Coast Junior College, Costa Mesa, California, which is adapting a part of the Santa Ana Army Air Base to educational usage, and Mount San Antonio Junior College, Pomona, California, which is utilizing the site and a part of the buildings formerly occupied by the Spadra State Narcotic Hospital.

Many other institutions have found it necessary to add to their present facilities and at least two new ones, El Camino Junior College at Lawndale, California, and Palomar Junior College at Vista, California, are planning and building complete new plants on new sites.

The Committee

Because of the problems faced by their various schools, Dr. Peterson appointed George Bell, President of Mount San Antonio Junior College, as Chairman of the Committee with Dan McNaughton, President of Palomar Junior College, Forrest Murdock, President of El Camino Junior College, and William Kimes, Business Manager of Orange Coast Junior College, as members of the Committee. To this group was added Dow Patterson, California State Department of Education, Division of School Planning, to act as Secretary.

Even though the committee is known as the Building Program Committee of the California Junior College Association, suggestions and recommendations

from junior college administrators and other educators interested in junior college building anywhere in the United States will be welcomed.

Committee Objectives

Instructions given by Dr. Peterson to the committee were that its specific duties would be:

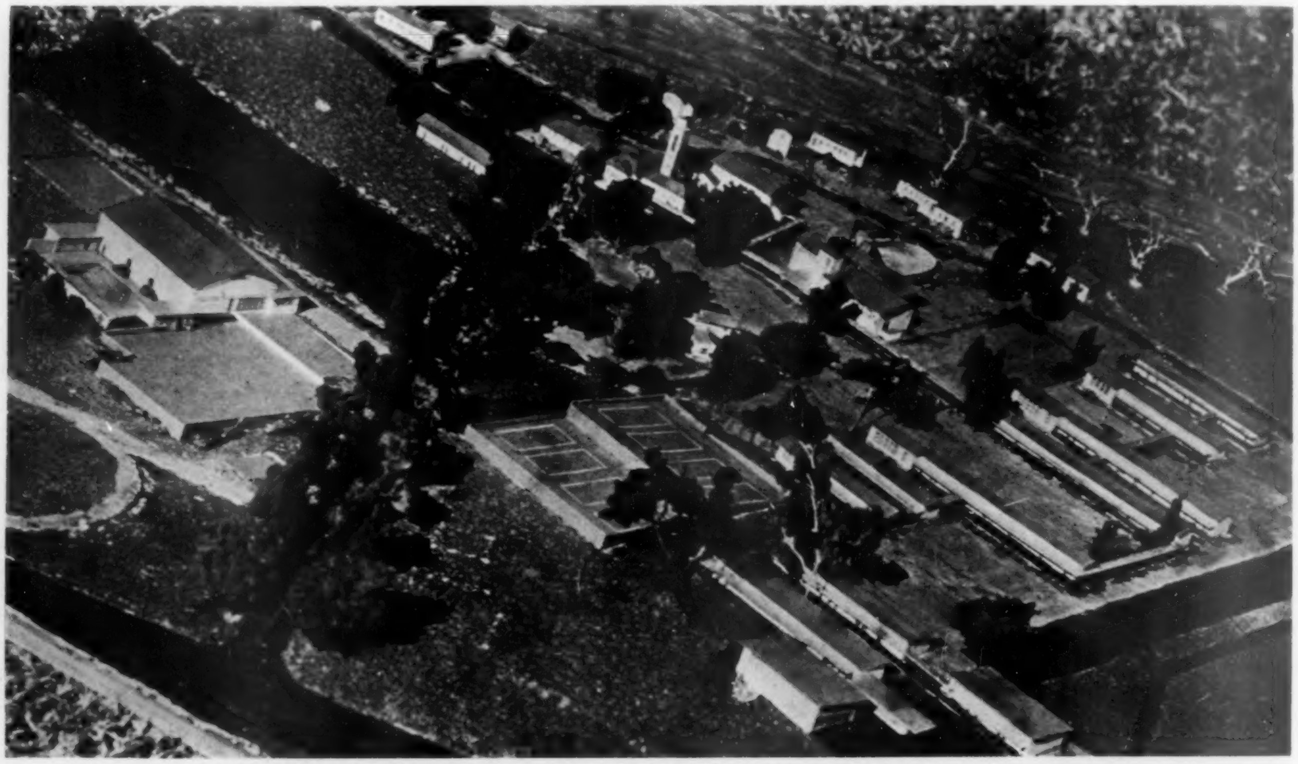
1. To cooperate with the State Division of School Planning in the formulation of standards for junior college buildings.
2. To give consideration to the desirability and advisability of recommending changes in California laws pertaining to junior college buildings.
3. To formulate recommendations relative to the conversion of Government buildings for junior college use.

However, in giving the above instructions, Dr. Peterson made it clear that the committee should feel free to consider any other problems dealing with junior college building programs.

At its first meeting the committee made a study of the article on *The Junior College Plant* written by Cecil D. Hardesty for the 1946 edition of The American School and University and voted to express its appreciation for the work done and to commend the author for his approach to the problem.

Next came the question of deciding how the committee should proceed with the task before it. It was decided to concentrate on the first of the objectives outlined by Dr. Peterson, namely that of formulating standards for junior college buildings. The group thought it advisable, at least for the present, to withhold consideration of California laws pertaining to junior college buildings. The consensus regarding the third objective, that of converting Government buildings to junior college use, was that it would be given ample consideration during the process of formulating standards for buildings. It was felt also that to avoid the tendency toward allowing its ideas to become static or crystallized, the committee should use the phrase: "developing recommended practices" in preference to "formulating standards" as it was originally stated in the first and main objective.

The committee has invited the administrator of every public junior college in California to present site plans for study and to make suggestions and recommendations that will facilitate the establishment of standards and criteria for the selection and utilization of junior college sites.



As junior college enrollments increase, sites like this become prerequisites to learning.

The Site

In consideration of present-day trends in site size the plan is to give some thought to site selection and utilization. Obviously the trend is toward larger sites which will no doubt necessitate new criteria for site utilization. Site sizes of some of the newer institutions range from eighty-one acres for El Camino College to four hundred forty-six acres for Mount San Antonio. In between these are Palomar with 130 acres, Orange Coast with 243 acres, and Clarence Pierce Agricultural Junior College of the Los Angeles City School system with 392 acres.

In accomplishing its work special consideration is to be given by the committee to some of these newer

To fill the need at Mount San Antonio, state hospital structures were converted for school use. At left is the administration building; below, the ward buildings.

schools, since plants in the process of being built furnish an opportunity to see how administrators and architects are attacking the problem.

Orange Coast Junior College

As was previously mentioned this school is acquiring a portion of the Santa Ana Army Air Base with its buildings. In order to afford time to master-plan the site for a complete permanent plant which would integrate some of the better and more adaptable government buildings with the new structures, the plan is to use the buildings with very little alteration at present. Some changes will be made later in various buildings as the school gets under way and the administration has an opportunity to survey the needs of the school and study the possibilities of the various structures. Thus far the only illustrative material available on this plant is a map of the entire air base which is drawn to such small scale that it does not afford much usable information.

Mount San Antonio College

On the Mount San Antonio campus are two types of buildings, permanent structures built by the State of California for narcotic hospital usage and temporary structures built by the Navy during the war for use as

The Mount San Antonio chapel, above, was one of these hospital structures, as was the cafeteria at the left. Also in use on the campus are temporary Navy buildings.

a base hospital. Most of the permanent structures are to be utilized with only minor interior changes.

Palomar College

Palomar College is housed at present on the Vista Unified School District High School campus in ten thousand square feet of temporary buildings built by the Federal Works Administration, plus classroom facilities which it is leasing from Vista High School. Classes are held from 3:30 to 10:00 P.M. to avoid conflict with the high school. The Board is in the process of selecting an architect and is discussing plans to bond the district for building purposes.

El Camino College

El Camino is at present using the facilities of Leuzinger High School of the Centinella Valley Union High School District. To avoid conflict with the high school the program runs from 3:30 to 9:30 P.M.

The College is spending $300,000 for temporary buildings which will include thirty-three regu'ar classrooms together with minimum administrative space and shop facilities. These buildings, which will be ready for occupancy in September 1948, are on a different part of the campus from that designated for permanent structures. Even though they are to be temporary and the plan of the Board and the Administration is to discontinue their use as soon as permanent structures can be erected to take their place, these buildings have been designed for modern daylighting and cross ventilation.

The first permanent buildings to be added to this temporary group will be the gymnasium to enrich the physical education program, and more adequate shop space to strengthen the trade and industrial offerings.

The Board has set up an accumulative building fund to run for five years. With an assessed valuation of $150 million, it is bringing in $330,000 annually, to which an additional $70,000 per year saved from the regular funds of the district will be added, enabling them to build their plant on a "pay as you go" basis.

It was hoped that a site utilization plan could be furnished to illustrate the "double-barreled" development idea of paralleling temporary construction for immediate emergency needs with the erection of permanent structures called for in the master planning program, but the architect has not yet completed his study of the problem.

Buildings and Classrooms

After studying sites the committee hopes to be able to make a study of buildings designed to serve the various parts of the junior college program, giving particular attention to classrooms to be used for special subjects or special functions.

For this part of its work the group expects to secure a substantial amount of illustrative material from the California Division of Architecture accumulated over a period of years in designing the seven California State College plants.

Here again, since the problem is national in its scope, any such material from any section of the country would be welcomed.

The plan is to hold one meeting each month throughout the year or until such a time as the agenda planned for shall have been covered. This agenda is to start with further study of the site and then take up libraries; science buildings, including facilities for physical, chemical and biological sciences; commercial buildings; classrooms for lecture purposes; shops for various types of technical training necessary for carrying on California industries; gymnasiums and physical education plants and equipment; cafeterias; little theatre buildings; student union buildings; assembly halls; and auditoriums. The completion of such an agenda should lead to recommendations on minimum needs for an adequate junior college program, and on optimum enrollment figures.

It is the hope of the committee that enough work can be done between now and the fall meeting of the National Council on Schoolhouse Construction, that something appropriate for consideration for adoption can be presented to that organization at that time. In this way the study could be instituted on a nationwide basis for the purpose of formulating recommended practices to be used in the development of junior college sites and buildings in all parts of the country.

Some of the members of the committee are now on a tour of junior colleges throughout the East, the Middle West, and Southwest to study buildings in those sections, attempt to create interest in the exchange of ideas, and give national impetus to the movement.

PLANNING THE COLLEGE UNION

By MICHAEL M. HARE

Hare and Elder, Architects, New York City

Michael Hare graduated Yale and Columbia Schools of Architecture and attended the Atelier de Frasse in Paris. He is a member of the American Institute of Architects and the American Federation of Art. His work has been on exhibition at the Architectural League of New York and at the San Francisco World Fair. Author of several works on community and school theaters, Mr. Hare has centered his activity on the educational field. His best known work is the million dollar Memorial Union for the University of Wisconsin.

THE College Union is an institution which has been known throughout the Middle West for almost half a century. Perhaps it is not as well known in the eastern states and some discussion is therefore in order as to its function in a university.

The basic purpose of any College Union should be to educate students in living with one another. To many this may seem like a new idea, as all too often these college recreational centers have been thought of as having a purely recreational purpose. Those of us who have been associated with this field over a period of years feel that the College Union contains the very essential core of modern education.

In explanation of this it might be pointed out that democracy is not furthered by mere technological improvement or technological education. The acquiring of knowledge without understanding is actually an invitation to autocracy in any of its many forms. It is generally admitted that in the long run the best defense against autocracy is widespread education of the people, but such a simple statement requires some elaboration.

Certainly a good Liberal Arts education is of assistance in understanding the meaning and consequences of varied political philosophies, but it is necessary to go further than this. We must put to use the student's knowledge, culled from widely divergent fields in a laboratory where the consequences of the use of his knowledge will easily become apparent. The College Union is that laboratory, a laboratory both in the ways of living and in the ways of government. For this reason it may be said that a university without such a program as is properly contained in a College Union is doing only half its job.

Student Activities Are the Hub

If it be admitted that this student activities center is in truth the hub of an educational program, it follows that it must also be the hub of the university physical plant as far as is practicable under the circumstances. By the foregoing I do not mean to imply that the program of a College Union is any more essential than other programs offered by the university. A wheel is as incomplete without the spokes as it is without the hub. It is also apparent that the physical plant of many colleges and universities is presently so arranged as to make a completely central location for the College Union impossible.

The following planning principles as to the site must be kept in mind. The Union should be interposed into the flow of student traffic between classes and adjacent recreational activities whether they be in the neighboring town or on the athletic field and also between dormitories and other outside recreational activities. The reasons for this are fairly apparent. As an example, it is clear that if the campus post office is located in the administration building, which straddles the most frequented inter-class circulation, then the post office tends to become the student center. The two objections to such an occurrence are obviously:

1. The student is not exposed to the program offered by the College Union at that time.

2. It will make the annual operation of the student Union more expensive as traffic is siphoned off.

Both educationally and economically the student Union should be at the center of the campus as far as is consistent with planning to permit proper parking facilities and close relationship to related activities.

Frequently the principles above are admitted theoretically at the time of planning the union, but the lack of foresight produces unfortunate results. To illustrate this, a comment from the University of North Carolina reads as follows: "The building was constructed without foresight of campus expansion. The campus is growing away from the student Union

which now stands on the side of the campus instead of the center."

The University of Wisconsin has the same deplorable situation. In this case, it is the university that is out of step with the Union. That is to say, the Union was planned in relation to Lake Mendota as the whole campus should have been, but the result is that the Union is on one side of the campus. I fear that this same situation will prevail in many universities following the postwar period of expansion. The illustrative diagram indicates the desirability of putting the activities center astride the main campus circulation. Although sometimes such a solution will impair the interior circulation of the building, ideally speaking, the College Union should serve as a funnel through which the student population must pass.

Relation to Educational Program

With regard to the architectural planning of a College Union the basic first principle is that no architectural planning is possible without advance educational planning. Far too often those who are charged with the responsibility of administering a College Union are confronted with a building planned without any relationship to an educational program. Perhaps, therefore, it will be best if we describe first the determination of the social program.

To begin with, the head of a College Union should be an educator, since the primary purpose of such a plan is education rather than business. To be sure, in most cases the College Union must support itself financially in large part, but it is too easy to lose sight of its primary purpose, and, supposedly in the interest

WHAT SHOULD BE THE PROGRAM OF A "UNION" IN THE UNIVERSITY

This Questionnaire is set up to determine what activities and facilities will best meet the needs and interests of students. Help us formulate the program. Please fill out this form immediately.

Please check (X) the following:

Sex: (M) _____ (F) _____ Year in School: 1 ____ 2 ____ 3 ____ 4 ____ Grad _____ Faculty _____ Alumnus _____

	Fraternity or sorority _____	unorganized lodging house _____
Place of Residence:	dormitory _____	apartment _____
	organized lodging house _____	own home _____

LEGEND

(A) Essential—Without this activity, the building will hardly qualify as a College Union.
(B) A desirable activity but one provision of which can be postponed.
(C) This activity is necessary only if its omission would result in its being placed elsewhere on the campus to the detriment of attendance at the union.

CHECK: *Order of importance*

_____ 1. Dancing—Evening: _____ Matinee: _____
_____ 2. Informal acquaintance teas for women.
_____ 3. Acquaintance gatherings for organized men's houses.
_____ 4. Outdoor dining facilities.
_____ 5. Cafeteria service.
_____ 6. Dining room service.
_____ 7. Snack Bar service and Lounge Men: _____ Women: _____ Mixed: _____
_____ 8. Lounge facilities Men: _____ Women: _____ Mixed: _____
_____ 9. Art Galleries and Art Lectures.
_____ 10. Auditorium for Recitals: _____ Concerts: _____ Motion Pictures: _____ Road Shows: _____ Student Dramatics: _____
_____ 11. Studio for Student Broadcasting Work.
_____ 12. Lectures and public forums.
_____ 13. Supper musicales.
_____ 14. Special Club Rooms for Meetings.
_____ 15. Camera Club Quarters.
_____ 16. Craft Workshops.
_____ 17. Offices for Alumni Organizations.
_____ 18. Offices for Student Organizations.
_____ 19. Dormitory Accommodations.
_____ 20. Phonograph listening room.
_____ 21. Library facilities.
_____ 22. Bowling.
_____ 23. Ping Pong
_____ 24. Billiards.
_____ 25. Tennis.
_____ 26. Swimming.
_____ 27. Winter carnival.
_____ 28. Outing Club Quarters.
_____ 29. Supply Store.
_____ 30. Barber Shop.

Add any suggestions of activities, services or facilities not mentioned above, which you think should be included.

of economy, to turn over its administration to an "accountant." Ideally speaking, when planning such a plant, the director of the Union would be selected in advance and he would commence the development of the educational and social program with the help of outside consultants on this aspect of the problem employed or associated with the architects. At this point it is necessary to undertake very considerable research. This requires the cooperation of many members of the faculty and of the student body. A frequent error in planning College Unions is made when the administrative head of the institution imposes from on high an administrative and educational setup on the still unborn College Union. Rather it is necessary to canvass faculty and student opinion on the various activities which they feel are most needed in the new center.

I do not mean to imply that a plebiscite be held and that the mere number of votes should determine whether a given facility or program be included. Rather from such research it will become apparent that there is a serious need for certain types of activities. Perhaps an expansion of an existing forum program may be needed, one which is presently conducted elsewhere in a restricted form or perhaps the provision of bowling alleys which will assist both in holding students' interest and in providing additional group activity that can be put to good educational purpose.

Therefore, questionnaires similar to the one illustrated should be sent out to all members of the university body. It will be noted that this requires those answering to identify themselves. Evaluation of these answers is the function of the educational consultant retained by the architects with the help of the new director or key members of the faculty. Once this research is completed it will be apparent that it is not possible to contain in this College Union every desirable program. As an example, the research may demonstrate that there are two events each year commanding the presence of the entire student body and common sense will show that it is not possible to house these two events in the Union because the facility necessary to do so would be uneconomically employed the balance of the year. It is necessary, therefore, to program as far as possible in advance the various events which will be housed by the building and to plan the facilities so that there will be both multiplicity of use and as far as possible constant use during the entire day.

Central Control Necessary

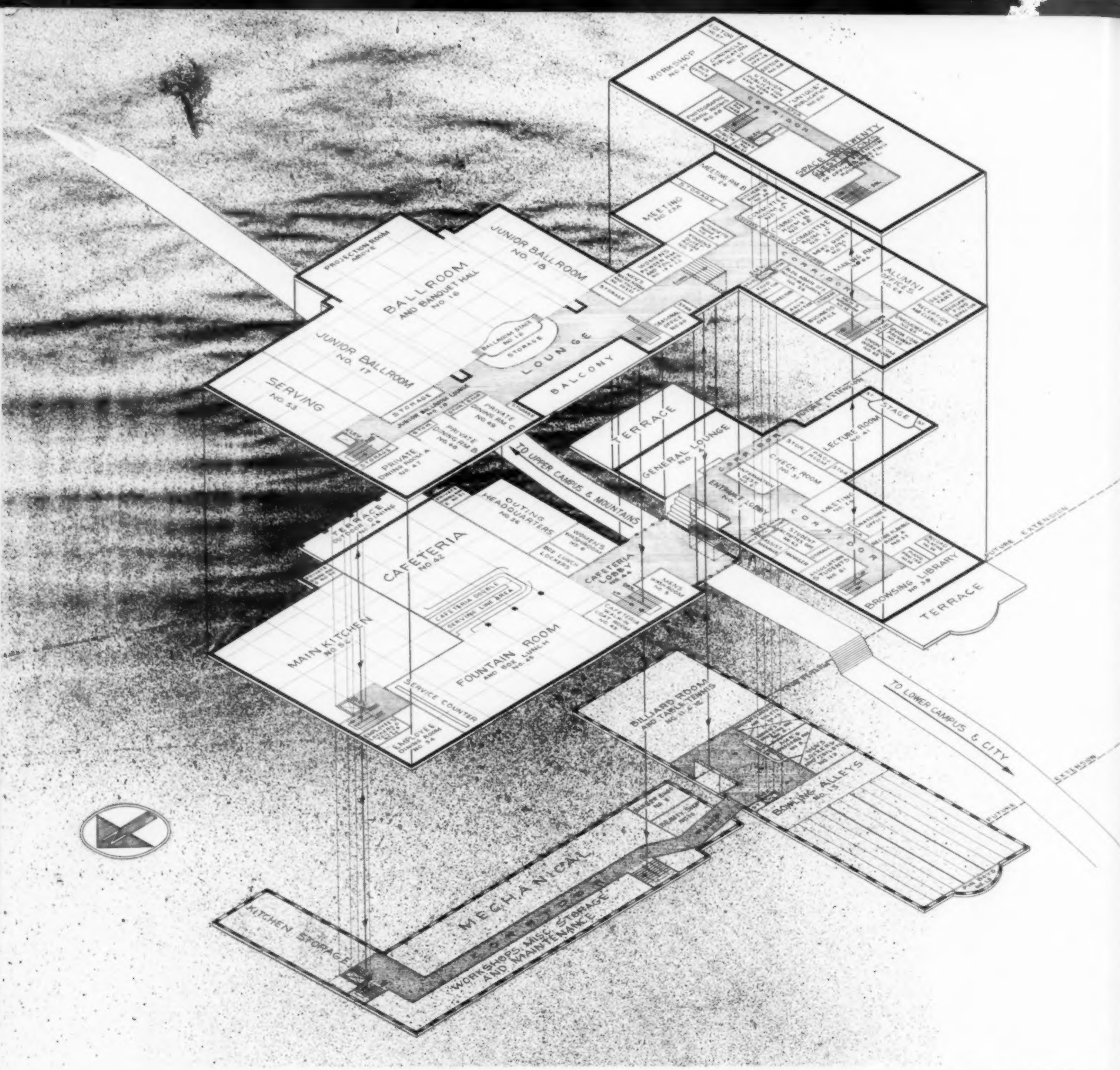
In this connection, another fundamental principle should be stated; that is, that all the space within the College Union available for events should be under the control of the director of the Union as effective head of a department of social education. The temptation has existed in the past to turn over to various organizations definite spaces in the College Union in return for financial support. A case in point is the YMCA at the University of Iowa. If the "Y" is in fact going to direct the whole College Union, that is one thing; but if it is simply going to have control of certain spaces in the building, programs will conflict with one another and will prevent the fully coordinated use of the building. This principle applies to the feeding facilities, the meeting room setup, and the auditoriums. In the case of the theater, when it appears that it should be incorporated in a College Union, the front of the house space should be controlled by the Union. The backstage areas are perhaps the only element in the Union which can properly be left to the control of another department of the university.

If College Union educational programs are thought of as continually evolving experiments for students in living with one another, it is apparent that the director must be assisted by an adequate educational staff as well as by the obvious maintenance personnel. No matter how well planned the College Union is physically, it will be a failure if its director is unable to explain any day's events in the building in relation to the educational purpose he has in mind. The reverse is also true. It is quite impossible to administer a proper educational program in a plant improperly planned physically. The reasons for this may not be apparent at first. It can best be illustrated by pointing out that the funds for proper administration are always limited and if we assume them to be fixed in amount, then it is clear that if the building is improperly planned the staff members will be unable to cover all the events which should be covered and control all the activities that are going on. The result will be that many desirable activities will appear to be undesirable because they lack proper direction.

A simple example of this concerns the provision and planning of a crafts shop. It should be clear that if photographic darkrooms are placed in the cellar of the building and woodworking shops are placed in one wing on the second floor, one staff member will be unable to supervise both activities properly. The conclusion will then be wrongly drawn that the crafts' program is not a worthwhile program, whereas the truth of the matter is that it was impossible to provide the necessary educational direction within the budget. Again, if the bowling alleys are far removed from the area given over to billiards and ping pong, more than one staff member will be necessary to control these activities. At first blush it might seem that such activities as these need only to be policed and that the cost of this should not be prohibitive even though they be separated. Yet this is not the case and there is no doubt that a program of bowling and billiards, if properly conducted, can be conducive to good social relationships among the students. To put this problem briefly, once the physical plant is presented to the college improperly planned, there are only two alternatives. One is to maintain a proper educational program in it by costly overstaffing, and the other is to make it operate economically by inadequate staffing.

Use Individual Plans

Frequently we are asked to make available to various colleges copies of the plans of existing unions in other institutions. It seems to me that what has been said here adequately explains why the copying or even inspection of other plans does not solve a given institution's problem. The educational program and therefore the physical plant must be made to order to suit a particular institution. In the past there has been a regrettable tendency to duplicate the errors of yesterday in the plans of tomorrow. Practically all of



Hare and Elder, Architects

Plan Organization of the College Union, from a program by Porter Butts

The architect must visualize the varied hourly activities within the College Union and then interlink them in the most convenient and suitable three-dimensional form

the College Union buildings now completed were planned before the principles of planning such buildings were well understood. For this reason almost all of them labored under definite planning disadvantages too numerous to mention. In fact, many of the fairly recent buildings simply copy the mistakes of the earlier buildings.

Since we happen to specialize in this field and therefore are conversant with the College Union plans of many institutions, and of course with the plans which we ourselves have made, it is all too easy when called upon for new plans to immediately adopt certain plan relationships which appear to crop up again and again in past plans. This is a peculiarly dangerous tendency on our part and one which we must continually guard against. It can well be imagined that this could be even more dangerous for architects without special knowledge of the problem because the consequences of lifting from another plan a physical relationship without understanding the educational relationship are serious.

If there is one fundamental principle in the architectural planning of a College Union, it is that every time one space is placed adjacent to another, the architect must picture in his mind's eye the actual activities going on in those areas—not at one time but

throughout the day and evening. I think this is almost the most difficult element in planning College Unions, as of course, as pointed out, multiplicity of use and scheduling of programs throughout the day in one space is essential to proper operation. As a brief guide to planning there follows here comment with regard to planning of some of the most vital elements of a College Union. Space prevents a discussion of the planning of some of the smaller facilities, the existence of which is inferred by the illustrated questionnaire.

Food Service

The basic principle which should be followed here is that the kitchens should be on the same floor as any of the dining areas which require short orders or *a la carte* service. On the other hand, it is permissible to use vertical circulation in such functions as banquets, dance suppers, and group meetings where the menu is determined in advance for all. In such cases, a servery should be placed on the same floor as the dining area involved. It should be placed, if possible, in such a way that it serves as many different dining areas on that floor as possible without crossing public circulation. In practice, this is very difficult to achieve.

In most unions, there has been a lamentable lack of proper kitchen planning, an exception being the kitchens at the University of Illinois. Although these have some objectionable features, such as low ceiling height, they have basically been planned in order to route the food continuously from storage through preparation to disposal. Another serious objection to most kitchen layouts in College Unions has been lack of adequate kitchen storage. Of course, this will be affected by the policy of buying the food. If there is central storage for the whole university, then the storage requirements for the Unions are less. Under no circumstances should prepared food be trucked over from other places. Another frequent lack is employees' lockers, restrooms, dining facilities, etc., which are necessitated wherever there is an extensive food service as there should be in a Union. A comment from Brown University may be of interest: "Would build a pantry, employees' dining room, receiving room, larger bake shop, storeroom which could be ventilated, dishwashing room needs enlarging." There is a general failure to understand that the service areas in a building have to be very large in proportion to the public areas. At the University of Indiana, the kitchens, for instance, are totally inadequate to the rest of the building which otherwise has a rather interesting plan. "Relocation of kitchens to increase efficiency of production and convenience to other places where food is served." Many similar comments have been made by other Union directors.

Turning to the public dining areas as opposed to the service areas, ideally there should be five types of units: the cafeteria to give quick but complete service; the fountain room for short orders and limited service which will most probably become the social heart of the building; a small *a la carte* dining room where students, faculty, and guests may eat in a civilized fashion on occasion; private dining rooms for special group meetings; and lastly, banquet space combined with the ballroom facilities. In addition, one or two of the committee rooms may on occasion be provided with their own kitchenettes in order to duplicate home atmosphere.

Public Lounges

These should be kept relatively small both in area and in number. In the first place, the tendency is for students to congregate in a fountain room rather than in a lounge. In the second place, the provision of several lounges, particularly the segregation of the sexes in different lounges, produces unfortunate results. The women's lounge will be empty on most occasions, if provided separately. Therefore, the women's lounge should be restricted to a very small room in conjunction with the restroom and powder room. The provision of inaccessible lounges presents serious problems of control. The main lounge and main corridor should also serve a secondary purpose as art gallery. In general, it is not desirable to introduce a separate art gallery as it will not be used sufficiently by the students, particularly if it is on an upper level. It is much better to introduce art exhibitions in the main flow of traffic. At Brown they commented as follows: "Would give up art gallery as such; would use common room and hallway areas for exhibitions. Our art gallery, located on the second floor, is not a vital part of our equipment." In this connection it should be pointed out that such exhibitions should be a vital element although they may be in another building on the campus. It is apparent that only a limited number of students will go to an exhibition in the art department.

Library and Music Facilities

These are essential features in a union building, and ones which should be planned together for easy control. Again, these activities should exist in the union building even though they may exist elsewhere on the campus. The library here is really a "browsing" room. The music rooms are provided so that groups of students may listen to selected programs from record albums. Several of these music listening rooms should be provided so as to take care of groups of varied sizes, from three or four, up to fifteen or twenty. In planning this and the library, the record album will be under the librarian's control and the librarian will possibly be in a glass enclosed central location, controlling all these facilities.

With reference to the library and music rooms, the director of the Wisconsin Unions says: "Can be away from center of building—for quiet and because people will climb stairs to read a book, although as always, the nearer a facility can be to center of traffic, the more use it will have. Definitely a popular unit, which too many Unions omit. Give special attention to lighting. Cove lighting no good. And plan a place for a supervising attendant near door. Good to have music rooms near library, so librarian can check out records. Two or more music-playing rooms important. Everybody doesn't want to listen to same program. And demand is heavy."

Meeting Rooms

The comment at Iowa State "need many more" is typical of the demand for meeting rooms. There are never enough, and furthermore, there is never enough

variety as to size. A rather interesting layout of meeting rooms exists at the University of Illinois. In this connection, however, it should be pointed out that these rooms are often used as dining rooms, and the arrangement used at Illinois necessitates crossing the service circulation and the public circulation, a most difficult problem to solve, as mentioned. Some flexibility can be obtained by soundproof, removable partitions. Of course, it is not possible to set forth how many and what size the meeting rooms should be. Cornell's comment is of interest: "Have more of them all on the same floor. Have majority with maximum capacity of 25—maybe two that would accommodate up to 100."

Student and Administrative Offices

There are two types of student offices. One is that which the students use day in and day out all day long, and the other is the one which is only used on occasion. Organizations requiring the latter type only should not be permitted to have an office for exclusive use, because such a policy would immobilize too much space in the building. Instead a central office should be provided for such organizations, and then each organization should be assigned file or regalia storage space. The student offices should be planned in connection with the offices of the Union director, as the organization of student extracurricular activities is a principle function of the director's office. Incidentally, it is not necessary to have the director's office immediately adjacent to the entrance to the building, as is so often done, with the possible exceptions in the very small Union. It should be kept in mind that in almost all Unions, a proper program is based on a proper staff for the director, and this office should therefore not be "skimped." It is possible to plan the director of maintenance's office separately from the director's office, and the same may be said of the director of food service. However, other members of the director's staff should have their offices and working area adjacent to his.

Ballrooms

The size and capacity of the ballroom or ballrooms play a very important part in the cost of the building. This should be determined only after a very complete survey as to the size and frequency of functions, as discussed. They should be so arranged as to permit functions of varying size and in such a way that the small dance will not be lost in a large ballroom. It is desirable also to plan them in connection with the small dining rooms and in connection with a reception space. This reception space can serve the dual purpose of acquaintance gatherings, teas, and other small receptions, as well as providing a lobby for the ballroom and a place to "sit out" a dance. The arrangement of ballrooms at Purdue University is of interest.

Workshops

It might seem that the provision of craft workshops was not a necessary item. However, it has been found that a craft program will introduce into the activities of the Union many students who otherwise would not participate. Such a program is more than usually dependent upon proper instruction. Basically, the craft workshop should be so planned that the space is easily divisible for various crafts of varying popularity.

Storage Spaces

General storage area, or dead storage, in a College Union should equal 7 to 10 per cent of the total area of the building. Unfortunately, this is rarely the case. In addition to the dead storage, there should be ample live storage spaces in conjunction with other activities in the building. These principles are apparent enough, but it is all too tempting to reduce the storage area when trying to reduce the building cost.

Game Rooms

Some sort of game rooms depending upon the local popularity of bowling, table tennis, etc., must be incorporated in a Union building. They should be so planned that it is only necessary to go down a half-flight. In the smaller unions it is very desirable, as mentioned above, to have all the game rooms use a central control point where an attendant may supervise billiards, table tennis, and bowling at one time.

Theater

Theater is not an absolutely essential part of a College Union, but is highly desirable where organization of the university permits it. The difficulty in planning theater in connection with the Union is that the Dramatic Department usually wishes to retain control, but this control must be limited, as previously discussed. At any rate, in planning theater facilities, it should be kept in mind that the behind-the-scenes activities are a vital part of the social program, quite apart from their function of teaching the dramatic arts. For this reason, it is desirable to plan the back-stage areas in conjunction with the circulation of the Union proper as well as providing public circulation from the Union to the auditorium. Even though sometimes it is not feasible to include a large auditorium in the College Union, it is always desirable, if possible, to include a "Little Theater." This small auditorium, seating anywhere from 150 to 500 people, gets a tremendous multiplicity of use, and should be planned in conjunction with the other meeting rooms of the Union.

Details May Vary

If what has been said seems to concentrate too much on first principles and not enough on detailed aspects of the plan, this is because it can be safely assumed that most modern architects are technically competent to juxtapose various plan elements once the program is really comprehended.

The comments on certain important functions of the College Union can only be considered as hints to the solution of a few of the important problems.

In conclusion, we must go back to a fundamental principle of architecture taken in its widest sense. The architect must actually assist in the planning of the environment, and not only in the planning of a building. If, when he gets through with all the technical work necessary on a College Union and sees it finally completed—if, at that point, his only satisfaction rests in its monumental aspects, and if he is unaware of the social forces working inside it, then he should have never planned it at all.

F.W.A. ASSISTS EDUCATIONAL PLANT PLANNING

By HARRY L. HEWES

Information Officer, Federal Works Agency

EDUCATIONAL authorities in the United States are confronted today with a record impact of problems. Among these are a tremendous increase in the birth rate during the war years which is already imposing its load on the elementary schools; heavy shifts in population, both within the cities and in regional movements; exodus of teachers drawn by higher pay available elsewhere; deterioration of school plant structure when materials were more urgently needed for implementing the fighting forces; current increases in building costs; expansion and extension of the whole public school program, preschool and post high school; and a demand for the school's larger integration into the general life of the community. In the field of higher education there has been an undreamed of demand for college advantages by veterans under the G. I. Bill of Rights. The spring of 1947 saw 2,300,000 students jammed into facilities built and equipped to accommodate 1,600,000.

The Federal Works Agency, the civilian construction arm of the Government, has stood somewhat in the middle of these programs for more educational facilities and its perspective of structural need, at least, is sharp and clear. The agency, or its constituents, have assisted in the construction of more than 15,000 public school buildings in the national emergency relief or the defense and war public works programs during the last fourteen years.

FWA's constituent, the Bureau of Community Facilities, under the Advance Planning Program, has made $23 million available to 2,153 school districts, funds to be repaid without interest when construction is begun, to bring blueprints and specifications to contract bidding stage for projects to cost an estimated $593 million.

When the Planning Program expired on June 30, 1947, with its parent legislation, the War Mobilization and Reconversion Act of 1944, there were 893 applications for school planning assistance still under review. Plans for 932 of the educational structures had been completed and approved and some projects were under construction by March 1948. From figures computed when advances in the program were repaid it was ascertained that the elapsed time between initiation of the project and contract bidding point averaged 18.3 months.

Federal Assistance Needed

Without FWA planning assistance an incomplete compilation listed 1,728 school projects for which plans have been completed to cost $276,217,000, while plans in the design stage numbered 2,486 to cost $891,253,000. Assuming that the 893 projects left on the vine when the planning legislation ended go forward to completion, there appear to be in the works plans for new educational structures to cost $2,058,512,000. As it has been estimated that it would cost about $5 billion to bring the tax-supported elementary and secondary school plant of the country to par, less than half of the expressed need would be met if by some miracle of construction all of the blueprinted buildings could be built within the year. Besides, few school districts have that kind of money.

Legislation has been introduced which would provide for a renewal of the Advance Planning Program with appropriations of $50 million a year for five years. Major General Philip B. Fleming, Federal Works Administrator, has emphasized that the cost of the program was limited to the relatively small sum required for administration; that the advances to the

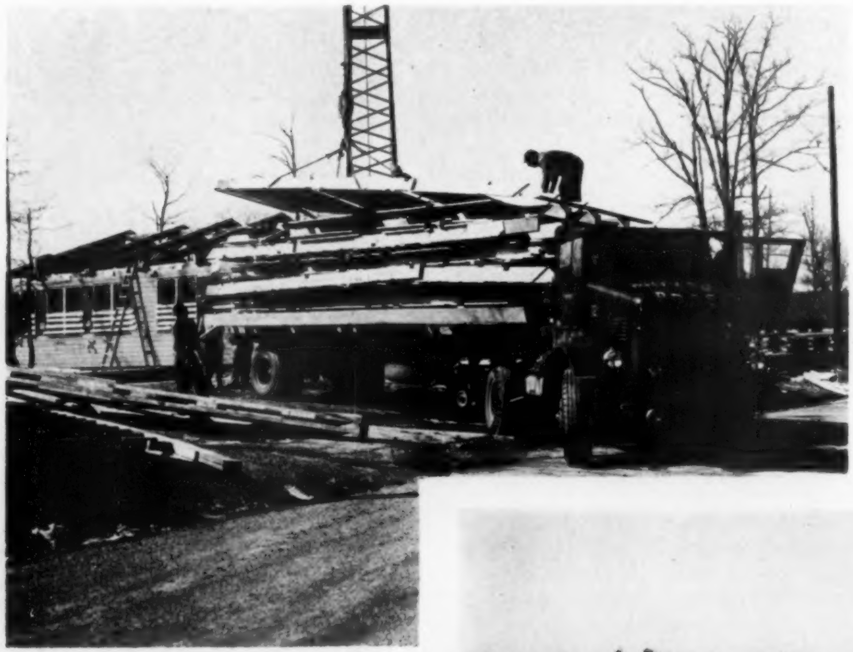
participating communities were in no sense grants; and that in each instance where an advance was authorized it had been ascertained that the applicant was fully capable of financing the intended construction without federal aid.

"Many months ago I became concerned over the fact that states, cities, and school districts of the country were doing very little to prepare detailed plans for urgently needed public works to be put under construction to ease any possible postwar employment crisis," General Fleming said. "As public officials are well aware, construction cannot begin until a lot of time-consuming preliminaries, including site acquisition, engineering surveys, preparation of working drawings, writing of specifications, and preparation of contract documents, are disposed of. Since it frequently takes longer to plan a school building than it does to build it, it seems to me imperative that planning everywhere should be intensified.

"It has been significantly pointed out that there is a difference in the need for schools, as compared with certain other types of local public works. The child passes through his school years but once; the other desirable projects often can wait."

Temporary Space Provisions

Under the Veterans' Educational Facilities Program, also administered by the Bureau of Community Facilities, 1,115 institutions of higher learning and vocational schools have been provided with more than 16,000,000 square feet of temporary structures for use as classrooms, laboratories, vocational shops, libraries, cafeterias, infirmaries and kindred structures—without, perhaps, providing more than a sort of stop-gap facility to meet the record overload enrollment, a costly but necessary program in the emergency. More than 7,000 war structures declared surplus by the War Assets Administration were dismantled, transported and re-erected for those schools where the U. S. Office of Education had certified "a need existed or im-



Wartime structures declared surplus are being dismantled and re-erected on college campuses as classrooms, laboratories, and faculty office buildings.

These buildings were transported from the Santa Ana Army Air Base to UCLA. Almost one-tenth of the VEFP went to 66 California schools. In addition, more than 6,000,000 items of so-called "personal property"—equipment, furniture, and furnishings—have been installed in or earmarked for California's educational institutions.

Three war surplus buildings from Camp Kilmer, Montauk Point, and Lido Beach, New York, were brought to the campus of Adelphi College in Garden City, New York. The H-shaped building on the left was contrived from three structures for use as a student activities center; the Quonset Hut was converted into an intimate laboratory theater; the L-shaped structure on the right provides an arts laboratory.

The "Hut Theater," as it was named by Adelphi undergraduates, has a seating capacity of 350 persons and is suitable for full-stage or capsule productions of drama or ballet. It is decorated handsomely and well equipped with lighting and scenic appurtenances. Courses in dramatics, acting, play production, directing, stage design, and stage craft keep it in constant use.

pended." Residential housing aggregating some 20 million square feet was made available from converted war homes for students and faculty members by the Federal Public Housing Authority.

And with all of this there isn't enough, even if the temporary structures had been permanent, planned buildings. Authorities are generally agreed that the pressure of students at all school levels will mount during the next decade. College enrollment of four million has been predicted by 1960. This promises to be the best educated generation in history.

How much added school construction do we need? George H. Field, Commissioner of the Bureau of Community Facilities, points to the 29,000,000 children enrolled in 1947 in elementary and secondary schools, the 1,500,000 five-year-olds who were not attending school, and recent high birth rates, and foresees a continuing and a sharply increased rate of enrollment during the coming decade. Then he looks at our colleges and universities with attendance of 1,300,000 in 1940, with a million more enrolled students in the present school year, and with 250,000 qualified for

matriculation who had to be turned away and concludes:

"There is no immediate panacea for the solution of our school facilities problem. It is not clear that local communities could shoulder the financial burden. It is not immediately possible to construct all the schools needed in view of current construction costs and competing needs for other types of public construction, to say nothing of demands made upon construction materials and manpower by requirements for housing and other types of private construction.

"The situation poses a very real problem for our elementary and secondary schools, and for our cities and towns as well as for our institutions of higher learning. School construction was postponed all during the war years; in fact, we have been living upon our capital of school and college buildings while accumulating deficits, since we have been unable to add sufficiently to our school plant recently.

"A country-wide survey made by the U. S. Office of Education covering preliminary figures for public and non-public elementary and secondary schools and higher institutions of learning shows approximate need of a program to cost about **$11 billion**. It is quite possible that a more complete survey would show that the **$11** billion estimate of need is a conservative figure since there is a dearth of accurate information due to a lack of complete state-by-state surveys of schools in existence and of needs for new schools. The National Education Association reported in **1944** a 10-year need for public elementary and secondary schools to cost **$12,900,000,000**. The National Resources Planning Board estimated outlays for education plant at **$12,400,000,000** in terms of **1940** prices.

"These figures become doubly significant in view of the current shortage of school facilities. Current enrollments necessitate overloaded classrooms and part-time instruction. The expected increases in school attendance in the next few years at public elementary and secondary schools and at colleges will be imposed on an already overloaded school plant.

"As a nation we have always prided ourselves upon the educational opportunities offered to our young people; it is a part of our national tradition, a manifestation of our standards of living. It is a tradition that must be continued, considering the world situation and the rapidity of technological and scientific advancement, if we are to maintain and improve our cultural standards. There was never a generation of Americans who faced greater responsibilities as citizens; never did we need more the mature and disciplined judgment of educated, balanced, and thoughtful men and women."

Local Review Necessary

An intense awareness of the situation is needed, both on a national basis and within each state and local community. Each locality should review the present status of its school plant and appraise its needs for the foreseeable future in line with prospects for growth, changing locations of homes within the city, and all other pertinent factors. Some idea of the local need for other types of public construction should be obtained and the income prospects of the city analyzed. Then a school construction budget could be set up on the basis of relative urgency and need.

With a clear picture in mind in each local community of what can be done at this time, added school capacity could be provided within the limits of a community's ability to pay and confined to the most essential projects. While this method of procedure might occasion some delay in meeting all school needs, it does make possible an immediate beginning towards a long-run solution rather than a complete postponement.

There was a large increase in construction during **1947** as reflected in valuation of contracts awarded. The total figure of **$319,494,000** compares with **$124,-499,000** in **1946**.

The 1947 figures by States follow:

Alabama	$ 4,140,000
Arizona	2,926,000
Arkansas	3,151,000
California	34,101,000
Colorado	3,256,000
Connecticut	6,514,000
Delaware	840,000
District of Columbia	2,701,000
Florida	8,363,000
Georgia	7,521,000
Idaho	877,000
Illinois	27,783,000
Indiana	4,223,000
Iowa	2,809,000
Kansas	2,901,000
Kentucky	3,505,000
Louisiana	5,294,000
Maine	418,000
Maryland	11,713,000
Massachusetts	3,411,000
Michigan	10,887,000
Minnesota	5,710,000
Mississippi	4,813,000
Missouri	4,533,000
Montana	1,624,000
Nebraska	598,000
Nevada	357,000
New Hampshire	335,000
New Jersey	4,668,000
New Mexico	874,000
New York	41,490,000
North Carolina	9,091,000
North Dakota	66,000
Ohio	14,811,000
Oklahoma	3,391,000
Oregon	5,230,000
Pennsylvania	6,056,000
Rhode Island	664,000
South Carolina	1,371,000
South Dakota	176,000
Tennessee	5,971,000
Texas	26,672,000
Utah	1,743,000
Vermont	943,000
Virginia	6,660,000
Washington	25,555,000
West Virginia	1,343,000
Wisconsin	3,074,000
Wyoming	341,000
Total	$319,494,000

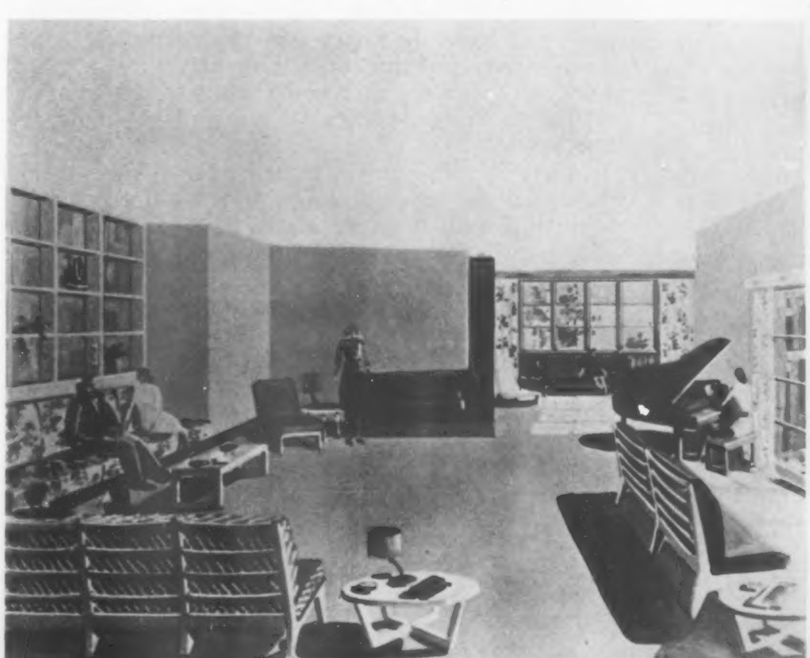
Architect's drawing of the proposed dormitory at South Georgia College, Douglas. The Federal Works Agency advanced funds for preparation of plans and specifications.

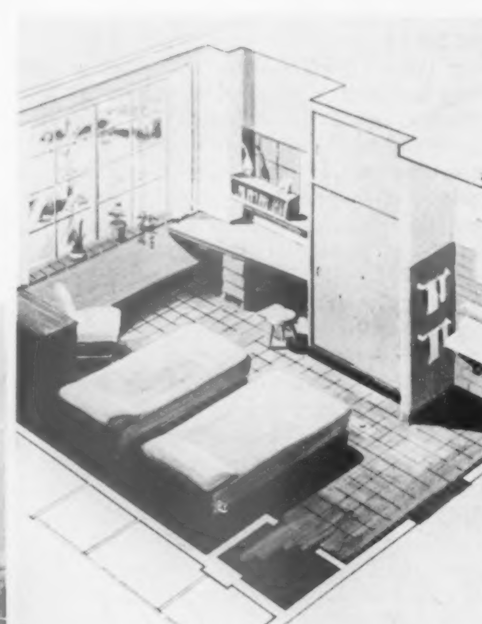
DORMITORY PROJECTS

By HARRY L. HEWES

RESIDENTIAL housing for a million more students than the nation's prewar college plant could accommodate will be needed by 1950 when full-time enrollment, including veterans, is expected to reach 2,675,000. This will call for 80 per cent more dormitory space than was reported to be available in 1947.

Expansion of the higher education plant—universities, colleges of arts and sciences, professional and technical schools, teachers' colleges and normal





Above, a student's room in the South Georgia College dormitory, which is estimated to cost $150,000. At left is a sketch of the dating parlor and lounge. Kuhlke and Wade are the architects.

schools, and junior colleges—will go far beyond the emergency measures by which 20,000,000 square feet of residential space were converted from war housing and installations by the Federal Public Housing Authority, and the more than 7,000 war surplus buildings which were dismantled, transported and re-erected on hundreds of campuses by the Federal Works Agency for educational and service purposes.

It is estimated that 65 per cent of this federal contribution in buildings, equipment and supplies to the capital needs of colleges should be credited to educational purposes, and 35 per cent to residential housing for single and married students and staff. Faculty members have to live somewhere, too. In engineers' language there is an unmet need of 95,558,000 square feet of additional residential housing, according to a joint survey of the Veterans' Educational Facilities Program by the U. S. Office of Education and FWA's Bureau of Community Facilities made public in March. One of four among 1,386 institutions included in the survey maintained no residential housing for students or staff.

Temporary Structures Inadequate

It is obvious that these needs cannot be met by temporary or contrived construction. The lifetime of these converted war surplus structures may be only a few years, five to twenty-five perhaps, and under the best existing conditions of the emergency programs there are too few surplus structures to take up the record student overload.

Major General Philip B. Fleming, the Federal Works Administrator, said, "It all adds up to the fact that the physical facilities of our colleges are swamped; that the effort to meet the pressure of students by utilizing the surplus structures, either those on site, or those moved to and re-erected on campuses can be only a temporary, although a significantly important, expedient, however costly or makeshift it may be. The Veterans' Educational Facilities Program has been described as 'wasteful but necessary.' "

But it is just as obvious that students enrolled for higher education under the G. I. Bill of Rights or otherwise must have places in which to sleep and study. The presence of large numbers of veterans with families has added a new note on many campuses. It was all very well for ex-G. I. students to assure President Millis at the University of Vermont that they would live in tents or cellars; the winter climate of Burlington wouldn't permit it even if there were cellars enough.

At Leland Stanford the Army's great Dibble General Hospital in nearby Menlo Park was made available as housing for married students; the University of Denver purchased a downtown hotel, converted the street floor into a law library and classrooms and the upper floors into students' apartments; at Dartmouth two of the three traditionally famous old dormitories known as Fayerweather Row were converted into living quarters for ex-G. I. students and their wives, with an understanding that in the instance of a visit by the stork they would move into the housing "villages" built by the college, but nobody made this rule clear to old Dr. Stork, it developed; war housing built for the thousands of workers in the Kaiser yards and plants in Richmond were occupied by students from the Berkeley campus of the University of California.

One of the most interesting student residential undertakings is that at the University of Miami, under the year-around summer skies at Coral Gables, where enrollment mounted to more than 7,000 students in 1947. The new housing project will provide 533 apartment units for more than 2,000 students on the new campus. Several of these buildings are now completed and occupied.

The need for residential space marches right along beside the need for more educational space at a thousand schools, and the best ingenuity of educators, administrators and engineers has been stretched to the limit. For lack of facilities more than 250,000 prospective students with credits for matriculation and the means for maintenance were turned away in a single school year since V-J Day.

Contemplated Buildings

FWA's Bureau of Community Facilities is in a position to take an embracing view of the whole jammed-up college picture. It not only provided the surplus buildings, equipment and furnishings from War Assets' Administration surplus where the Office of Education certified the need, but under other legislation it administered the Advance Planning Program by which funds were approved for preparation of plans and specifications up to contract stage for essential non-federal public works, a program which expired on June 30, 1947, with the War Mobilization and Reconversion Act of 1944.

In the Advance Planning Program, funds to be repaid when construction is started were approved for 283 college edifices in all parts of the country, and among these were projects for the planning of sixty-six dormitories or residential housing at forty-four institutions, which is more than a conventional drop in the big bucket of dormitory need. Plans for most of these residence projects have been completed, construction has started on a number, and most of them may be ready for occupancy with the new school year next September.

There is to be much additional construction, without federal assistance. More than 180 schools on the college level have reported completion of plans for new structures with other projects in the design stage, to cost more than $300,000,000. But with private and governmentally-assisted efforts, both federal and state, this won't be enough to meet anticipated demands, neither for next September nor in a long-range view. It has been estimated that it would cost $5,000,000 to bring America's college plant to par by 1960.

Among dormitory projects under the FWA Advance Planning Program eight dormitories with other apartment units to cost an estimated $4,100,000 are to be built on the Columbia campus of the University of Missouri; eight colleges are planning dormitories in Texas; the University of Vermont, after a forceful and brilliant campaign enlisting housing assistance from the Burlington townfolks, is drawing specifications for its first campus dormitory, to cost an estimated $418,000; a dormitory in Laramie at the University of Wyoming will involve expenditure of approximately $700,000.

A great men's dormitory is a part of the expansion

program at Rutgers, and four dormitory units to house 300 students are to be built at Rhode Island State College at Kingston. Seven Georgia State colleges also have received FWA advances for planning dormitory facilities, and a structure to house women students at Henderson State College, at Arkadelphia, Ark., is planned to cost $1,200,000. One of two new dormitories on the Lexington campus at the University of Kentucky, to cost in excess of $2,000,000, is nearing completion, and seven new dormitories are to be added to the College Park residential facilities at the University of Maryland.

The list of residential projects for which FWA approved advances for planning follows:

	Location	Description	Estimated Cost
Arizona			
Tucson	Univ. of Arizona	Dormitory for 220 women	$ 363,948
Arkansas			
Arkadelphia	Henderson State Teachers College	Women's dormitory	1,232,063
Magnolia	3rd Dist. A & M College	Two dormitories	334,950
Russellville	Ark. Polytechnic Inst.	Dormitory addition	82,627
Georgia			
Albany	State Teachers' College	Dormitory	155,000
Americus	Board of Regents of the Univ. System of Georgia	Classroom—dormitory bldg.	118,000
Cochran	Middle Georgia College	Dormitory	160,000
Carrollton	West Georgia College	Dormitory addition	85,600
Dahlonega	North Georgia College	Dormitory	322,400
Douglas	South Georgia College	Dormitory	149,600
Tifton	Abraham Baldwin Agri. College	Dormitory	128,000
Illinois			
Chicago	Univ. of Illinois	Students residence—1st. unit	1,625,700
Kentucky			
Frankfort	Frankfort State College	Dormitory	164,170
Lexington	Univ. of Kentucky	Men's dormitory—women's dormitory (both with dining facilities)	1,244,470 854,140
Maryland			
College Park	Univ. of Maryland	Six dormitories	668,200
Michigan			
Ann Arbor	Univ. of Michigan	Men's dormitories	4,560,165
Houghton	Mich. College of Mining and Technology	Dormitories	1,175,000
Mississippi			
Perkinston	Perkinston Junior College	Boys' dormitory	182,172
Missouri			
Columbia	Univ. of Missouri	Apartment units for 112 families	562,700
Columbia	Univ. of Missouri	8 dormitories	3,610,630
Jefferson City	Lincoln University	3 dormitories	925,000
Kirksville	N.E. Missouri State Teachers College	3 apartment units	844,330
Montana			
Billings	Eastern Montana Normal College	Women's dormitory	185,000
Nevada			
Reno	Univ. of Nevada	Dormitory	397,872
New Jersey			
New Brunswick	Rutgers	Men's dormitory	722,300
New Mexico			
Portales	Eastern N. Mexico College	Dormitories	387,238
Ohio			
Toledo	Univ. of Toledo	Women's dormitory	443,180
Oklahoma			
Norman	Univ. of Okla.	Dormitory, recreation hall and dining building	862,672
Durant	Southeastern State College	Dormitory	497,720
Rhode Island			
Kingston	State College	4 dormitory units for 300	692,595
South Carolina			
Columbia	Univ. of S. C.	Women's dormitory	550,000
Tennessee			
Knoxville	Univ. of Tenn.	Dormitory	941,704

	Location	Description	Estimated Cost
Texas			
Alpine	Sul Ross State Teachers College	Dormitory	405,750
Canyon	W. Texas State Teachers College	Women's dormitory	412,000
Commerce	E. Texas State Teachers' College	2 dormitories for 450 women	600,000
Denton	State College for women	4 dormitories	761,330
Kingsville	Texas College of Arts and Industry	3 dormitories for women with dining hall building	841,540
Lubbock	Texas Tech. College	Dormitories for 300 women and 165 men	1,562,875
Nacogdoches	Stephen F. Austin State Teachers' College	Dormitory	336,000
San Marcos	S.W. Texas State Teacher's College	2 dormitories	246,000
Vermont			
Burlington	Univ. of Vermont	Dormitory for 150	418,200
Wyoming			
Laramie	Univ. of Wyoming	Dormitory for men	664,000
			$31,476,841

SCHOOLS REQUEST SWIMMING POOLS

By HARRY L. HEWES

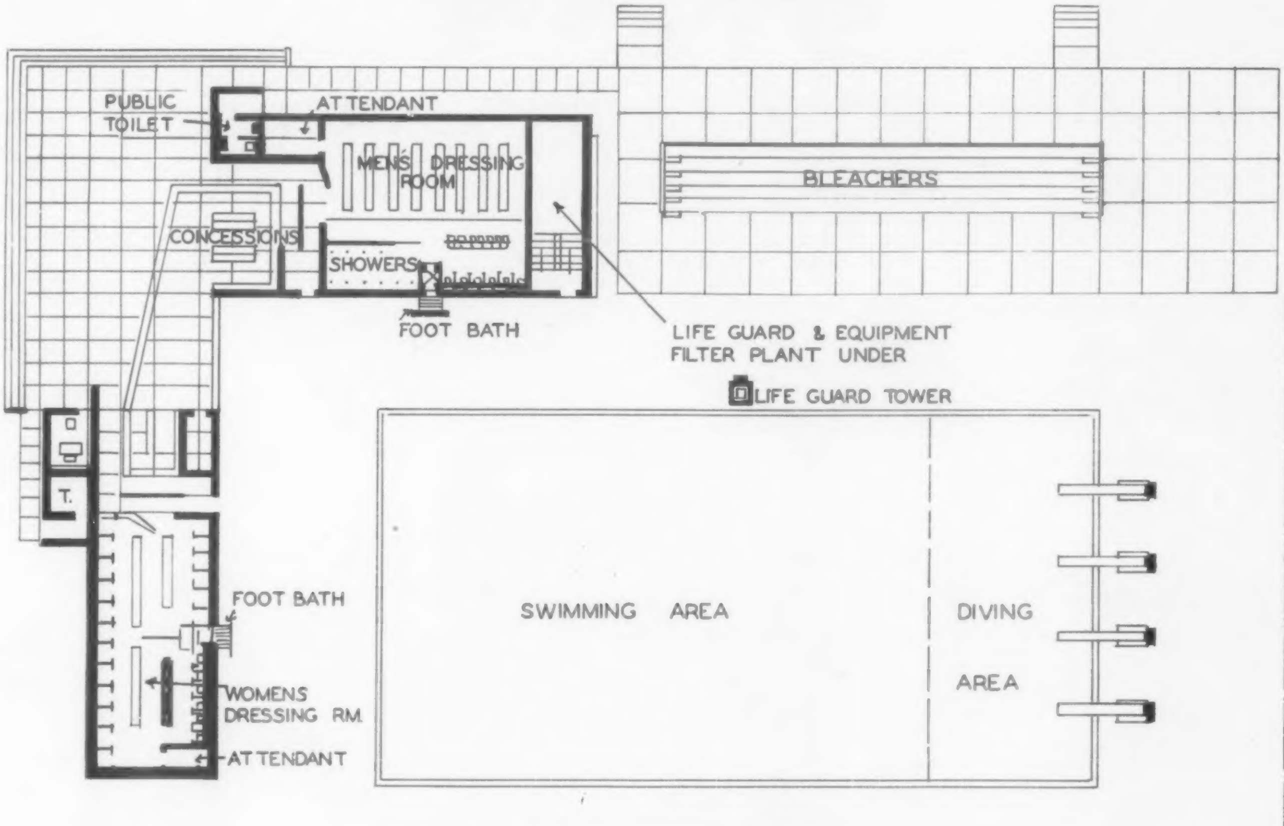
THE old swimming hole and the Three R's were once companionate—or at least contemporaries. But times have changed. Instead of playing hookey youngsters can go in swimming right in the school building these days, or in the adjoining school yard. Plans for twenty new school structures for which the Federal Works Agency advanced repayable funds for bringing blueprints and specifications to contract-bidding point, include pools. While they do not represent any large proportion among the 2,006 school projects recently placed on the architects' drawing boards, such requests do mark a trend.

The swimming pool is only one of the advantages of the new public school plants as the school district and board officials described them in their applications for FWA assistance in planning. Not only do the requests reflect an increased age span, from kindergartens and pre-school age facilities at the bottom to junior colleges at the top, but they indicate that among the educators who experienced the impact of war-time nurseries there are those who now maintain that the care of the whole child is a proper responsibility of public education. In addition, they show the advance of adult education and night school programs at all levels.

Within current memory the gymnasium as a public school adjunct was regarded as a fad and foible; the youngsters could get plenty of exercise without using taxpayers' money for additions to schoolhouses, said the critics. And the modern school auditorium, built for presentation of full stage productions, ballets and concerts, would have drawn frowns from many who were not quite sure that the theatre wasn't a tricky appurtenance of the devil. Cafeterias and kitchens have become a generally accepted facility in the public schools, as have vocational work shops, band and orchestra rooms, and clinics.

Swimming is one of the more recent additions to the school curriculum, and, like the earlier innovations mentioned, enjoys a growing popularity. The number of applications for assistance in constructing swimming pools indicates the belief of many educators that swimming should be an important part of the physical education program.

Applications for planning assistance which list swimming pools at schools include:



Swimming Pool Plans at Schools

Location	Type of Public Work	Applicant	Total Estimated Cost	Federal Advance for Plan Preparation
California				
Sacramento	Sacramento College—Outdoor swimming pool and bath house.	Sacramento City Unified School District	$ 130,700	$ 7,200
Fresno	New Fresno High School swimming pool.	Fresno City High School District	162,000	9,000
Fresno	New Roosevelt High School swimming pool.	Fresno City High School District	162,000	9,000
Manteca	High school additions, music building, agricultural unit, swimming pool and gymnasium.	Manteca Union High School District	296,000	12,200
Hayward	Additions, boy's gymnasium, swimming pool, farm shop, trade shop.	Hayward Union High School District	630,000	27,000
Idaho				
Dayton	New high school with classrooms, library-study room, science and domestic science rooms, shops, cafeteria, gymnasium, auditorium, swimming pool.	Joint Independent School District No. 1	422,550	16,000
Illinois				
Barrington	New high school building including classrooms, academic rooms, gymnasium, auditorium, administrative offices, industrial arts unit, cafeteria, community rooms, swimming pool.	Barrington Consolidated High School District No. 224, Cook County	940,000	31,950
Marengo	Gymnasium, bleachers, swimming pool, shower and locker rooms, music and art rooms.	Marengo Community High School District No. 154 McHenry County	302,860	9,550

Swimming Pool Plans at Schools (*Continued*)

Location	Type of Public Work	Applicant	Total Estimated Cost	Federal Advance for Plan Preparation
Lincoln	New community high school building including classrooms, library, science rooms, homemaking department, cafeteria, commercial rooms, shops, gymnasium, auditorium, swimming pool, locker and dressing rooms, heating plant.	Lincoln Community High School District No. 404, Logan County, Ill.	$890,568	$28,200
Mendota	Four high school additions, including vocational training and auditorium entrance, cafeteria, home economics, addition and alterations, girls' locker room, coal room, swimming pool, boys' locker room.	Mendota Township High School, District No. 280 LaSalle County, Illinois.	250,000	7,193
Riverside	High school addition and connecting physical education building, classrooms, swimming pool, gymnasium, band and practice rooms.	Riverside-Brookfield Twp. High School District No. 208, Cook County, Ill.	530,000	9,461
Louisiana				
Slidell	New swimming pool for Slidell High School.	St. Tammany Parish School Board	8,160	480
Michigan				
Port Huron	New high school, gymnasium and power plant, classrooms, laboratories, auditorium, band room, cafeteria, swimming pool.	School District of the City of Port Huron	2,251,820	74,227
Missouri				
Maryville	High school addition with gymnasium and swimming pool.	School District of Maryville	223,500	7,150
Ohio				
North Bend Hamilton County	Gymnasium-swimming pool.	Cleves North Bend Village Local School District	160,000	6,000
Oklahoma				
Elk City	Stadium improvements and spectator seating for swimming pool.	Board of Education	12,652	468
Pennsylvania				
Wilkes-Barre	Additions to James M. Coughlin High School including classrooms, auditorium, two gymnasiums, swimming pool, cafeteria.	School District of the City of Wilkes-Barre	1,491,000	30,000
Utah				
Kaysville	High school addition, auditorium, administrative offices, industrial arts, swimming pool.	Davis County School District	371,000	13,300
Wisconsin				
Shawano	Additions and alterations to existing high school building including gymnasium, swimming pool, auditorium, laboratories, library, lunchroom, vocational shop unit for domestic science, manual arts and agriculture.	City of Shawano	555,000	20,950
Oshkosh	High school addition—35 classrooms, gymnasium, auditorium, swimming pool, offices.	City of Oshkosh	860,600	32,000

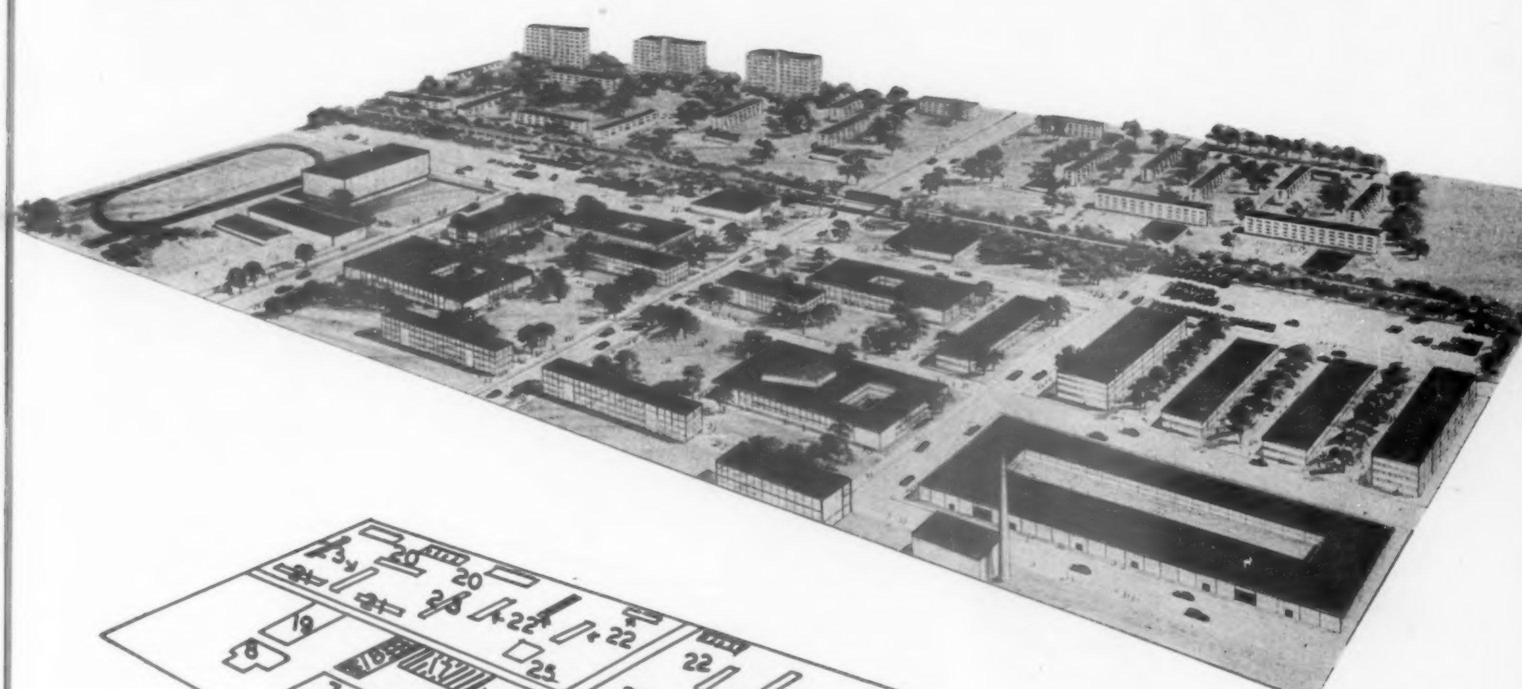
TRANSLATING A BLIGHTED URBAN AREA INTO A UNIVERSITY CAMPUS

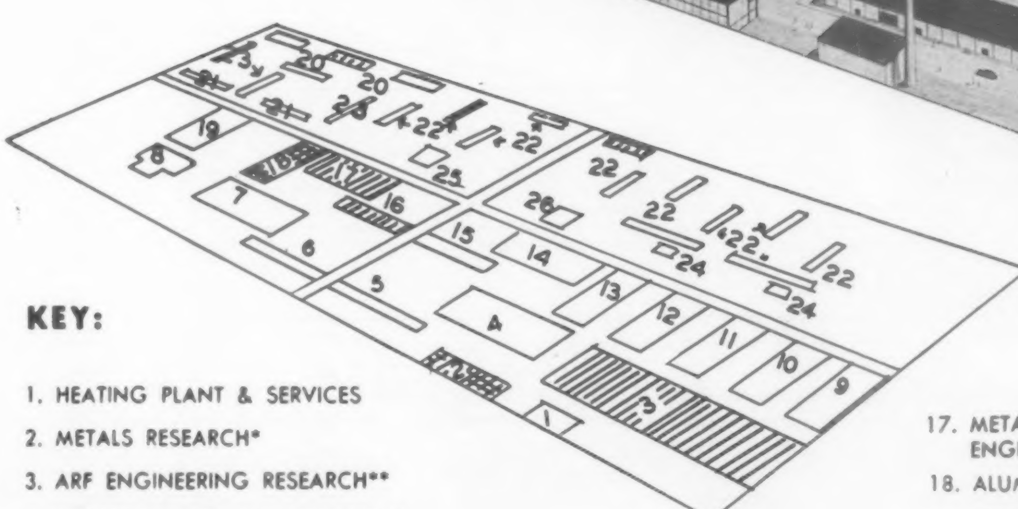
By R. J. SPAETH

Treasurer, Illinois Institute of Technology

Chicago

The world's most modern center for technological education and research.

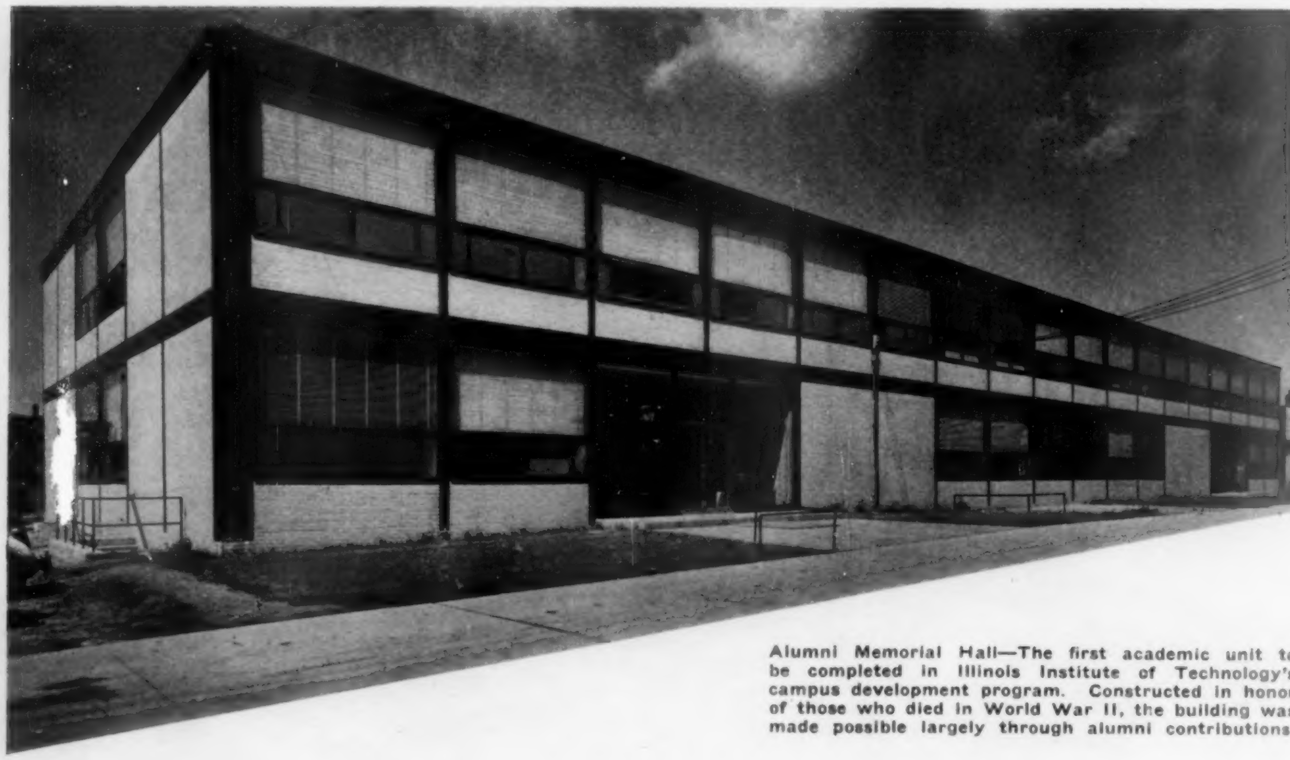




KEY:

1. HEATING PLANT & SERVICES
2. METALS RESEARCH*
3. ARF ENGINEERING RESEARCH**
4. STUDENT UNION & AUDITORIUM
5. ELECTRICAL ENGINEERING & PHYSICS
6. CIVIL ENGINEERING & MECHANICS
7. LIBRARY & ADMINISTRATION
8. GYMNASIUM & SWIMMING POOL
9. RESEARCH LABORATORY
10. RESEARCH LABORATORY
11. INSTITUTE OF GAS TECHNOLOGY
12. ARF RESEARCH & ADMINISTRATION
13. ARCHITECTURE & APPLIED ARTS
14. MECHANICAL ENGINEERING
15. LIBERAL STUDIES
16. CHEMISTRY**
17. METALLURGICAL & CHEMICAL ENGINEERING**
18. ALUMNI MEMORIAL HALL*
19. FIELD HOUSE
20. APARTMENT—10-STORY
21. APARTMENT—3-STORY
22. DORMITORY**
23. ROW HOUSE
24. RECREATION
25. COMMONS BUILDING
26. COMMUNITY BUILDING

* Built ** Partially Completed



Alumni Memorial Hall—The first academic unit to be completed in Illinois Institute of Technology's campus development program. Constructed in honor of those who died in World War II, the building was made possible largely through alumni contributions.

Mr. Spaeth was born in Salina, Kansas. He received an A.B. degree from American University, Washington, D. C., and an M.B.A. from Harvard. He became assistant business manager and administrative assistant to the president of American University, serving eight years, after which he became business manager of Illinois Institute of Technology, then treasurer and executive secretary. He is a member of the Economic and Union League Clubs in Chicago.

IN THE heart of the United States' largest contiguous slum area, Illinois Institute of Technology is building its new modern utilitarian campus—Technology Center.

As Illinois Tech reaps the benefits of its program of construction and rehabilitation, so will the slums immediately surrounding it, the whole blighted south side of Chicago, and the outlying suburban areas.

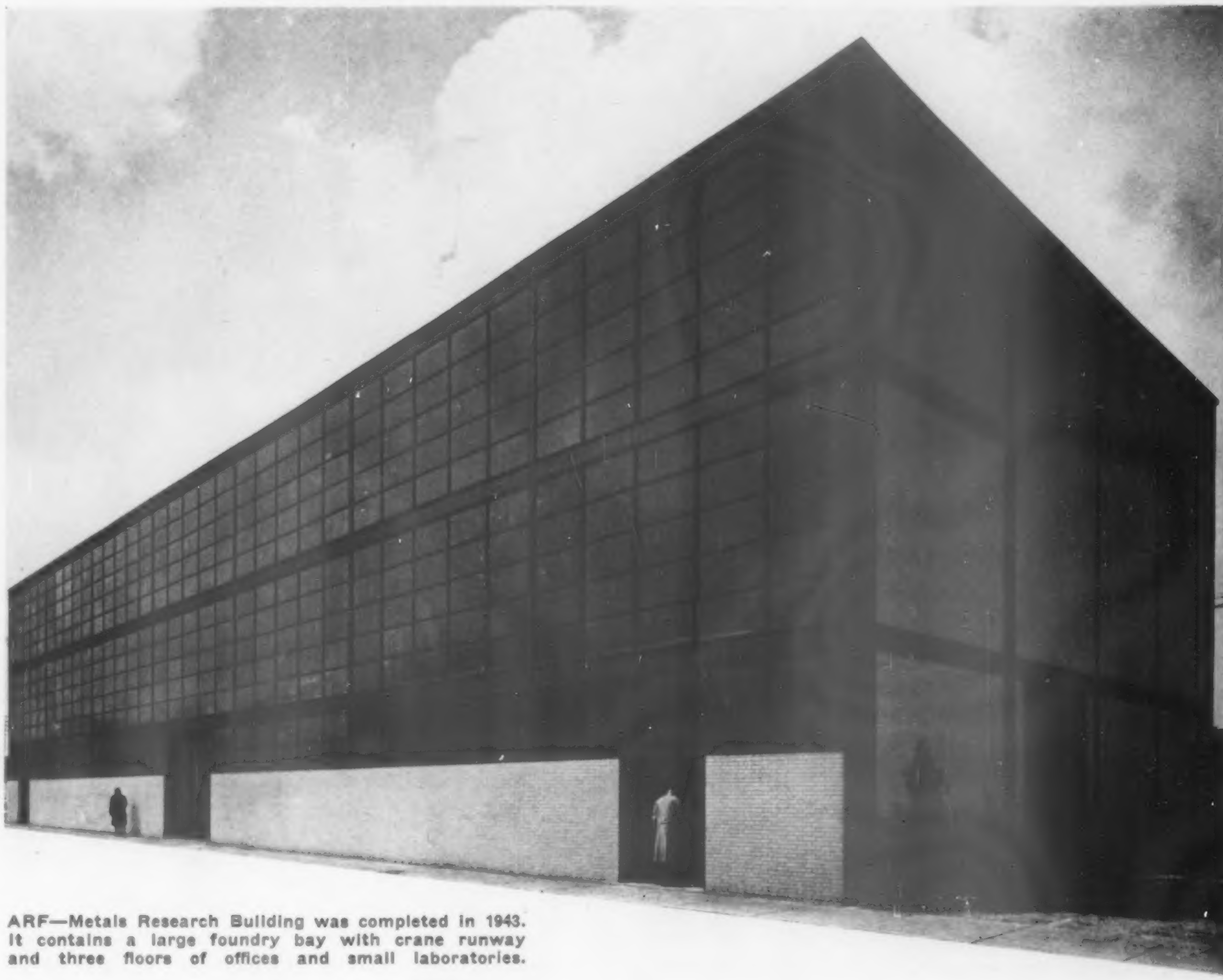
Building a college campus in a slum area is an unusual undertaking—one not often attempted by an institution of higher learning. Illinois Tech's decision to do just that is proving sound, and its board of trustees and staff are meeting the challenge.

In 1940, the boards of trustees of two institutions, Lewis Institute and Armour Institute of Technology, decided that a merger would serve education and research in greater measure than the two schools could as separate institutions. They created a new institution—Illinois Institute of Technology.

Selection of Site

The board's first problem was one of location of the new college. Both Lewis and Armour had been founded during the nineties in desirable residential districts. By 1940, both were enveloped in slum neighborhoods and housed in obsolete, poorly-maintained buildings of questionable architectural standards. The physical facilities of each were inadequate for the educational and research programs envisioned by the trustees of the new college and its president, Henry T. Heald.

Consideration of the residential source of the student body played a large part in determining the location. Before the consolidation, students had come chiefly



ARF—Metals Research Building was completed in 1943. It contains a large foundry bay with crane runway and three floors of offices and small laboratories.

from homes in Chicago and outlying districts. To continue the college's comprehensive night school program, its trustees had to consider traveling time and evening course facilities. For both day and evening students, a location near the center of the metropolitan area was desirable.

Consideration was first given to the downtown area known as the Loop. This was abandoned because sufficient space was not available at non-prohibitive costs. Land adjacent to the Loop on the near west and south sides was blighted. Available land along the lake shore north of the Loop was too costly.

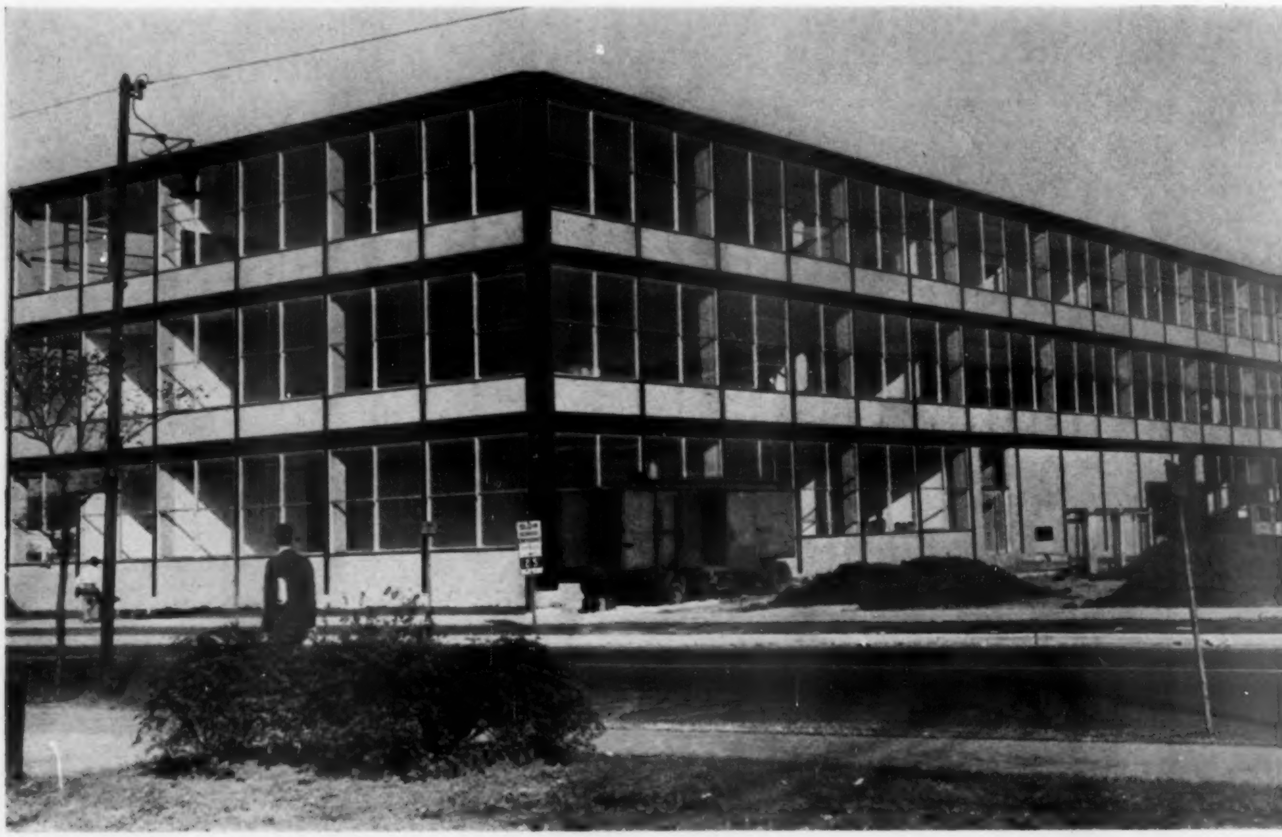
Search for a possible city location finally narrowed down to the central south side, where the Institute's program was already functioning. There were serious drawbacks. The neighborhood around 33rd and Federal Streets was run-down. It had once been the residential neighborhood of the elite—the Armours, Swifts, and Cudahys—but it had degenerated until it was notorious for its slum conditions.

However, there was good reason to believe that the property deterioration had gone about as far as it could go. Work and wise planning could make it better, and improvement in one area would cause a general uplifting of the entire south side.

It was on this premise that Illinois Tech began to plan and build for the future.

The original Armour campus contained less than two square blocks. Survival, much less improvement, was impossible in such a small area. The first step was to project the campus area to 12 city blocks, or about 50 acres. This would provide adequate land for the long-range educational and research program, and it would be sufficient to stimulate the redevelopment of the adjacent slum area.

Work was just beginning when World War II came.



Looking northwest toward the new chemistry building just recently completed.

The onset of war temporarily halted the program as the Institute bent its every effort to training and teaching and research for war industries and the armed services.

War's end brought additional problems which further complicated the development program. The Institute's student body had grown rapidly. Not only the Chicago area but the entire country and more than 20 foreign countries were represented in the student body. The necessary increase in teaching staff was difficult to secure because of the acute housing shortage.

Despite the difficulties, the board of trustees believed that the Institute could do its job adequately only if it encompassed a larger area. It was apparent, further, that housing was needed. Boundaries of the projected Technology Center campus were extended to include 12 more city blocks, thus doubling the area and increasing it to 100 acres; and a program of housing development was started.

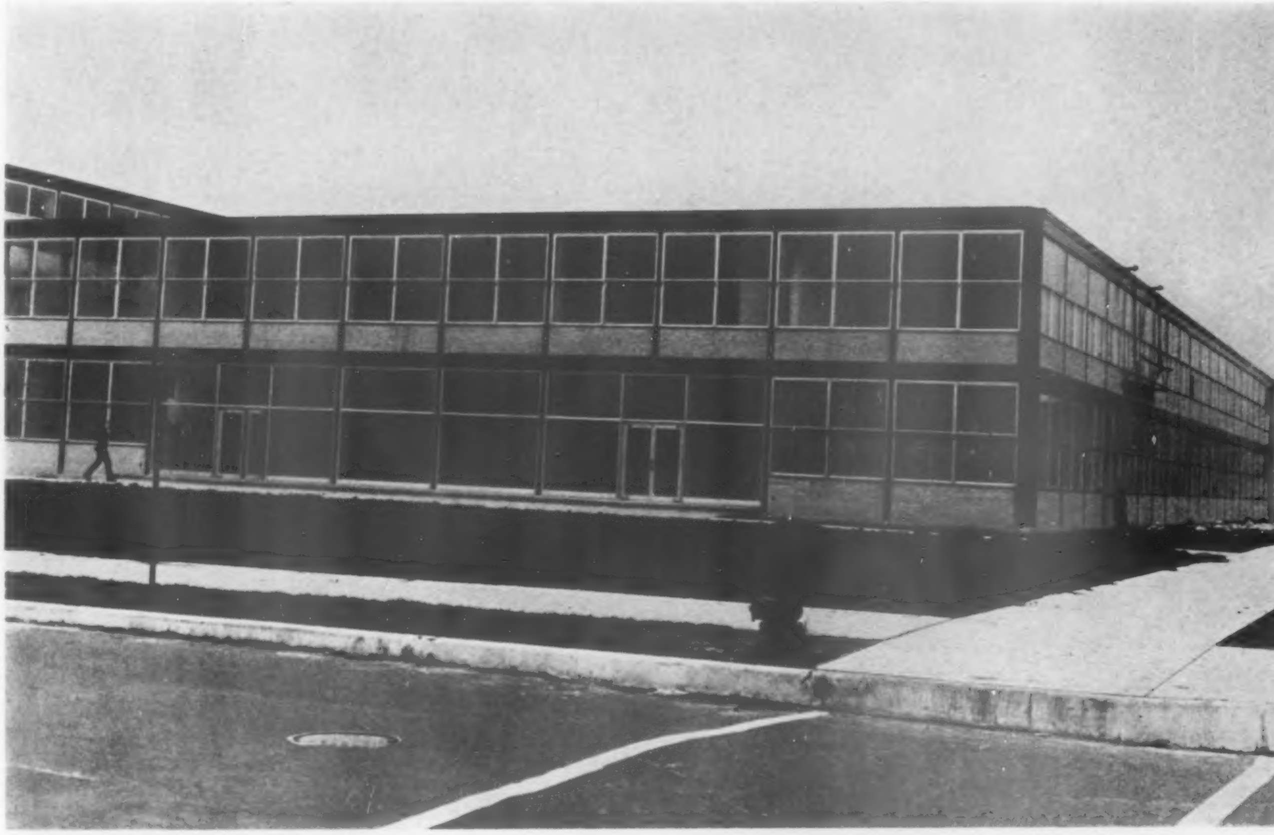
Campus boundaries are now 31st Street on the north, Michigan Avenue on the east, 35th Street on the south, and the New York Central Railroad right-of-way on the west. The campus area, three miles south of the Loop and one-and-a-half miles west of Lake Michigan, is served by bus, elevated trains, street cars, and automobile thoroughfares.

Rehabilitation of 100 acres of land is desirable and admirable, but it is not enough. The whole seven-square-mile slum section on Chicago's south side required immediate attention and gradual rejuvenation. Numerous half-hearted attempts had been made to improve existing conditions, but no really concerted community action had been undertaken. Absentee ownership precluded active leadership from within the blighted area. Illinois Institute of Technology and other institutions in the area assumed the responsibility for planning a program of improvement.

Community Cooperation

A community organization was formed to rebuild and redevelop the central south side. Known as the South Side Planning Board, this organization brought together all those interested in the program—residents, industrial leaders, and representatives of educational, medical, and humanitarian groups.

The South Side Planning Board started its work by drafting a plan to transform the area from its present slum conditions into an attractive community of well-placed homes and industrial plants. It is now securing community-wide and city-wide acceptance of its plan.



The Metallurgical and Chemical Engineering building, containing laboratories, classrooms and offices.

Simultaneously, it is working toward the investment of public and private capital for its rebuilding program.

For the first time in Chicago's history, legislation was passed recently to enable the city to attack the slum problem in an active, aggressive manner. Citizens voted $30,000,000 to carry out the initial steps of the program. Because of the South Side Planning Board's early effort, it is hoped that slum clearance measures will proceed rapidly on the south side in a relatively short time.

Other groups, also believing that rehabilitation of the area is necessary and possible, are proceeding with individual development plans. Michael Reese Hospital, with plans for a large medical center, has started construction. Other hospitals are planning building programs. Two large modern housing projects have been completed by the Chicago Housing Authority and a third is under way just north of the Illinois Tech campus.

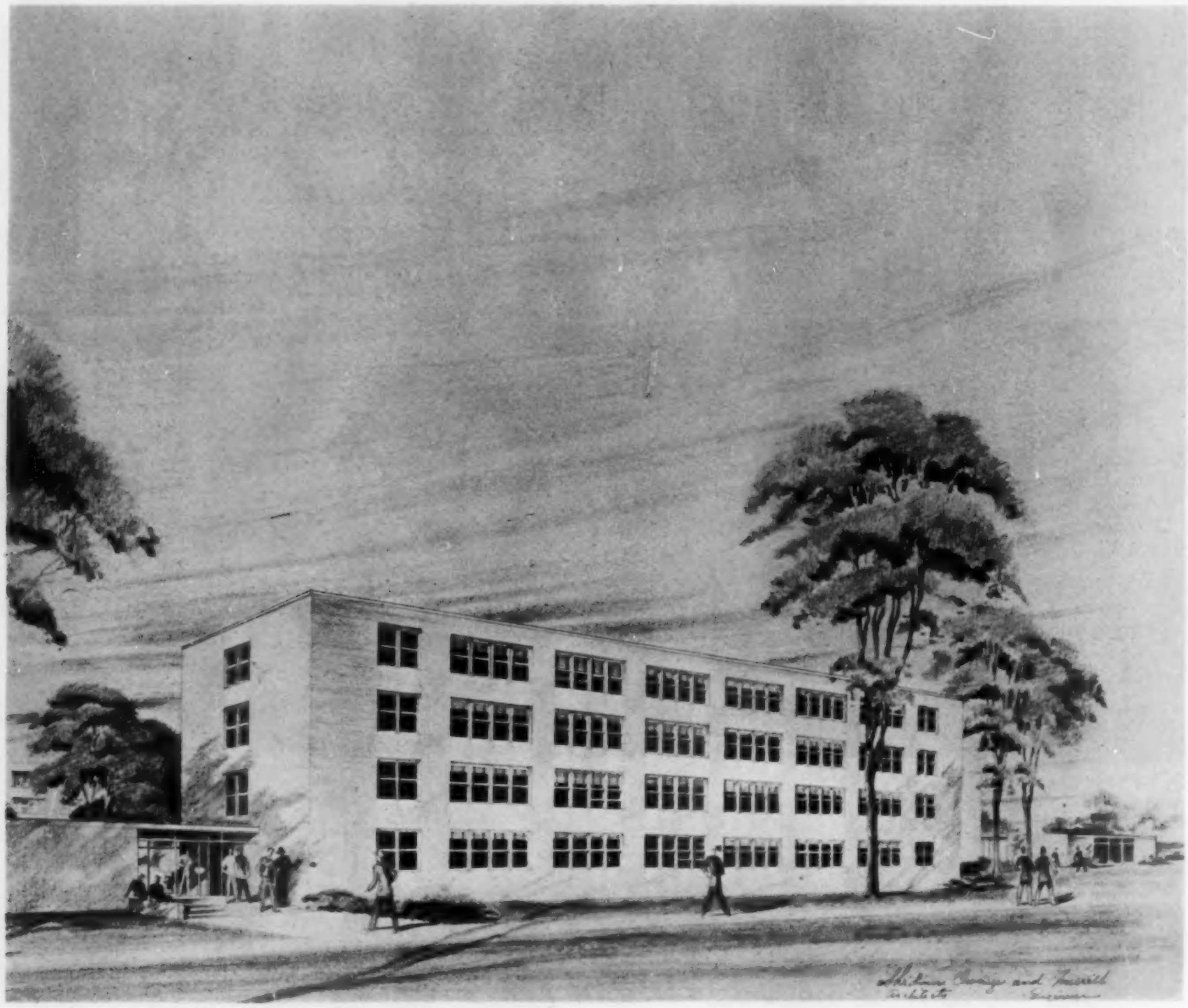
Industries which in the past have threatened to leave the area now have decided to stay. One of the largest printing firms in the world has just completed construction of a modern plant. Evidence indicates that the entire city has awakened to the possibility of reclaiming the area. On every hand there is new confidence in the future of the south side.

Difficulties Overcome

As the Illinois Tech campus expanded, land purchasing became a major task. Prior to the passage of slum clearance legislation, the Institute had no powers of condemnation. It had to acquire land as would any individual buyer. Its proposed campus area contained some 750 individual parcels of land, owned almost entirely by separate individuals. Many had died or left the land unclaimed. Some tenants had long paid rent to persons who claimed ownership but had no titles. Over 90 per cent of the land was tax delinquent, with taxes accumulated over periods up to 30 years.

Despite this maze of difficulty, substantial progress has been made in land acquisition without resorting to legal action. Some of the more difficult purchases remain to be negotiated. Land costs have averaged only about 75 cents per square foot. Improved properties have run to about $1 per square foot, with vacant land slightly more than 25 cents.

Land acquisition, however, has not presented the worst problem. Getting possession of the land already acquired has been continuously frustrating. The gen-



Artist's drawing of one of the four-story dormitories. Two of these buildings are in the process of completion.

eral housing shortage and the economic status of the residents of the area—mostly Negroes—have resulted in an almost impossible barrier, that of transition or permanent relocation.

As a semi-public institution with a humanitarian approach to the problem, Illinois Tech has resorted to eviction only in rare and unavoidable instances. Although attempts at land clearance have been discouraging, the future is bright. It is expected that the city's slum clearance program will make some of its early facilities available to tenants of the area.

Accomplishments to Date

Technology Center is illustrated in *Figure 1.* This artist's sketch views the campus from the southwest corner looking northeast. The plan is divided, with the western half for educational and research buildings and the eastern half for housing. The city elevated line right-of-way, to be landscaped, runs through the section reserved for housing.

Space for the educational and research plant provides for the existing program and future expansion. Enrollment in the educational division now approximates 8,500 students—3,500 full-time day students and 5,000 evening students—largely in the various fields of engineering.

Expenditures for industrial research have reached an annual volume in excess of $3,500,000.

The total Institute staff now exceeds 1,300 employees.

The total educational and research area eventually will include some 20 structures, with a total of 19,000,000 cubic feet. At the outset, cost was estimated at approximately $10,000,000. At today's construction costs, it will probably be double that amount.

Ludwig Mies van der Rohe, head of the Institute's

Engineering Research Building—The above section, which comprises one-third of the final building, was completed in 1945.

Department of Agriculture, is the designing architect for the educational and research plant. On buildings already constructed, his associates have been two leading architectural firms of Chicago: Holabird & Root, and Friedman, Alschuler & Sincere.

In designing the Institute buildings, the architects have sought to provide strictly functional buildings with more character than is usually displayed in most utilitarian structures. The design is a far cry from traditional college Gothic. From superficial observation, the buildings seem less expensive to maintain than traditional types. However, certain refinements that add to the character of the buildings sometimes result in greater maintenance costs.

The campus has been laid out in 24-foot squares, which have become the basis for all future column lines. Buildings contain a number of unusual features, such as visible use of structural steel frames, eight-inch brick exterior walls, and large amounts of glass. Five buildings have been completed.

The Metals Research Building, *Figure 2,* was completed in 1943 at a cost of about $225,000, or 50 cents per cubic foot. It contains a large foundry bay with crane run-way and three floors of offices and small laboratories.

The first section of the Engineering Research Building, *Figure 3,* which comprises one-third of the final building, was completed in 1945. It is a one-story, 22-feet high building with a great deal of open laboratory space. Cost of the first unit was $400,000, or about 50 cents per cubic foot.

Alumni Memorial Hall, *Figure 4,* was completed in March, 1946, at a cost of $350,000, or 70 cents per cubic foot. It houses the Naval Reserve Officers Training Corps program and the department of architecture and contains a large naval armory, classrooms, offices,

and drafting rooms.

The Metallurgical and Chemical Engineering Building, *Figure 5*, was completed in December, 1947, at a cost, without equipment, of $975,000, or about 75 cents per cubic foot. It contains laboratories, classrooms, and offices for these two departments.

The Chemistry Building, *Figure 6*, was completed in November, 1947, at a cost, without equipment, of $740,000, or about 90 cents per cubic foot. It provides laboratories, classrooms, and offices for the chemistry department.

A central transformer vault, part of the future heating plant, has been built. Construction was started following a decision to purchase, rather than generate, electric power. Designed by the firm of Sargent & Lundy, the utility system connects all buildings by a walk-through tunnel. All steam, electrical, and other utility conduits will be enclosed in the tunnel.

Electricity is purchased from the utility company at 12,000 volts and distributed at 4,000 volts to transformers in each block of buildings, where it is again reduced to serve individual buildings at required voltage.

A final decision has not been made as to the design of the central heating plant, but it probably will burn coal since the Institute is located adjacent to the railroad siding and can receive coal directly from the mines.

The utility system is laid out in a double loop. The outer loop serves the entire area, and the inner loop serves only the educational and research plant. This permits constant utility services even though a break occurs at some point in the loop.

Description of Housing Provisions

Housing units have been designed by Skidmore, Owings & Merrill, Chicago architects, to blend with the buildings of the educational and research area. This project will include 24 buildings, providing a total of some 1,800 units varying from single dormitory space for students to row houses with seven or eight rooms for staff members.

It was estimated originally that the housing project, including land, would cost $7,500,000. At today's construction costs, however, it will probably exceed $10,000,000. First bids on dormitory units indicate that the cubic foot cost will exceed $1.32.

The north half of the housing project will house staff members, and the south half students. The project includes:

Three 10-story 104-feet high elevator apartments, each containing 120 units—62 two-room and 58 three-room apartments.

Eight row houses consisting of six and seven rooms each.

Three 3-story walk-up apartments, each containing 18 units of four rooms each.

Open space has been provided for additional buildings if staff needs require it.

Eight dormitories, each with facilities for 100 or 200 students, and four fraternity houses, each containing facilities for two fraternities of 50 persons each, are included in the student housing program.

Two other large structures are proposed for location in the heart of the campus. One will be a community and clubhouse which will contain shops and service stores. A second will house a commons and provide dining rooms for students.

It had been hoped that construction could begin immediately on five of these units, including one 10-story building, two 3-story walk-ups, and two 4-story dormitories.

Because it was impossible to clear all of the sites, initial construction is limited at present to two identical 4-story dormitories, *Figure 7*. These are scheduled for completion by September, 1948. At today's costs, these two units, including architectural fees, will cost about $250,000 each.

In addition to its own housing program, the Institute has made economic studies of possible community housing projects in the area surrounding the campus. It is hoped that either public or private finance can be interested in undertaking these developments.

Illinois Tech is engaged in a long-range public relations and fund raising program. Construction of the new campus will proceed as rapidly as funds are provided. Eventual expenditures in the proposed redevelopment will approximate $30,000,000.

LIFE SCIENCE BUILDING, INDIANA UNIVERSITY

By THEODORE J. YOUNG

EGGERS & HIGGINS, Architects, New York

Mr. Young graduated from the University of Toronto with the degree of Bachelor of Architecture. He is a registered architect in New York State and a partner in the firm of Eggers and Higgins. He is a member of the American Institute of Architects and has been designing and planning university and public buildings for twenty-five years.

THE new Life Science Building soon to be constructed on the campus at Indiana University marks the abandonment of the notion that each of the biological sciences is a water-tight compartment of knowledge. Since the building will be the largest of its kind in the United States, and, perhaps, in the world, it will epitomize the synthesis of these sciences.

Perhaps it is true that the eternal challenge to all architects is to fit the design of a building into the pattern of the concepts of the persons who will use the building. Nowhere could this be more applicable than in the design of Indiana University's Life Science Building.

Mutual Interest of Sciences

The keynote for our work was succinctly stated as long ago as May, 1945, by Fernandus Payne, Dean of the Graduate School of Indiana University and head of the University's department of zoology. We have kept his statement in mind because it seemed so cogently to state the problem not only that confronted those at the University who must use the building, but also the architects.

Dean Payne said:

"Three science departments, bacteriology, botany, and zoology will be housed in the building. All three are biological sciences and so have certain things in common. All of us work with living forms, plant, animal, including man, and bacteria in which fundamental life processes are the same. These sciences also have close relationships with other sciences; chemistry, physics, physiology, medicine. Formerly the sciences were more or less separate compartments, but today they are interrelated, as indicated by such terms as bio-chemistry and bio-physics."

Here we have a clearly stated, basic idea flowing, perhaps, from a variety of complex developments in recent years, among which are the advancement of

science and the concomitant needs and working problems of men engaged in scientific fields. A further glimpse at the reasons for, and advantages of grouping these units, is therefore pertinent.

Beginning with mutuality of interest, Dean Payne and his colleagues view centralization as a logical, necessary step. As a practical matter, this means better opportunities for the discussion of common biological problems. As much as we may like to believe otherwise, the fact remains that the physical distance that separates men of common interest frequently becomes a barrier to which they unwittingly yield, and hence an intellectual distance results. This is especially true where there is great concentration and activity, where time presses, and where the day's work must be completed.

As Dean Payne puts it, "In separate buildings, men seldom see each other."

Further, the closer contacts that result from association in one building help to break down barriers between departments. We may begin with the premise that the sciences are closely interrelated and are becoming more so, but we must provide the readiest means possible for interchange of ideas.

From the administrative as well as the scientific point of view, the new building marks another step forward. It provides opportunities for cooperation in teaching, thus avoiding duplication and overlappng of courses.

Another element of consequence is efficiency in operation. The grouping process makes it possible to use common equipment for research purposes, eliminating waste and assuring maximum utilization. One electron microscope, for example, should serve the needs of three of the departments in the new building. The inter-departmental library is another example of joint use to the advantage of all.

In addition to these advantages, the Life Science Building provides a common meeting ground for graduate students, thus broadening their outlook and knowledge.

With these considerations in mind, we can more clearly understand the goals of all who participated in the planning. We were seeking to weave together infinite threads—the strands of knowledge and ideas of men. Our objective is a building that stresses utility, but does not ignore comfort. Men at work must also be at ease.

Advantages in Combining Facilities

It would be an understatement to say that Indiana's Life Science Building runs through the alphabet from A to Z. The combination of facilities ranges from animal runs to a Geiger counter room where instruments measure radio activity; from a herbarium and anthropological museum to photographic rooms and humidity-controlled X-ray laboratories.

Perhaps we were not on pioneering frontiers when we undertook to combine these facilities in one building, but at least we were aware of the fact that the combination was unusual enough to warrant the closest coordination with the scientists who expect the building to serve as a home for research and instruction.

In this connection Dean Payne provided us with another keynote. In the early stages he said: "A university has three main functions. Through its libraries, primarily, it serves as a guardian of the accumulations of the past. Secondly, it is a place where students, young and old, may come and learn. To aid in the processes of learning, teachers are employed. A third function of any great university is the advancement of knowledge. We who will use the Life Science Building are students, teachers and investigators. Many of us will work in this building from morn to night, and even into the night. It will be our workshop, almost our home. To carry out the functions mentioned, we need a common library, classrooms, seminar rooms, animal rooms, greenhouses, storage rooms, constant temperature rooms, museum rooms, offices, and, most important of all, laboratories for both teaching and research. The laboratories in the three departments will have much in common, particularly botany and zoology, yet each will have its own individual needs. The lecture rooms may be used in common. In the laboratories a wide variety of equipment will be needed, such as work tables, sinks, hot and cold water, gas, electricity. Lighting is an important factor."

Design Represents Composite View

To us, this meant that the science and art of architecture had to be blended with the realistic necessities of complex use. It is for this reason that the building represents a composite view of all who participated in its design.

Coordination in design was not, however, the whole answer. Other problems were just as real. For one thing, both the University authorities and the architects were confronted with the inescapable fact of site conditions. There was only one site and it had definite limitations. The form of the building is therefore, to a large extent, due to the specific restrictions caused by site conditions. The dream of architects always is to have ample space. Had this been available the building might have taken different form. It might have been desirable to reduce the height and spread out the building, thus providing more roof space for greenhouses and animal runs. No such opportunity existed. Nonetheless, it was necessary to design the building so that expansion might ultimately be obtained through the demolition of adjacent buildings of minor significance in the future.

Even in the matter of exterior architecture, practical considerations prevailed. The building is to be located on a prominent thoroughfare immediately adjacent to existing University buildings. The style of these buildings has been fixed as a policy of the University. Our problem, therefore, was to design a building consonant in appearance with those in existence but interiorly arranged for scientific use. The use of Indiana limestone for exterior material follows University regulations.

Bearing in mind Dean Payne's guiding precept, the building is located on the campus adjacent to the Medical Building and near the Chemical Building.

As the building took final form in the thinking of University authorities, it combined four sciences: botany, zoology, bacteriology and anthropology. The links among these sciences are reflected in the arrangement of the facilities.

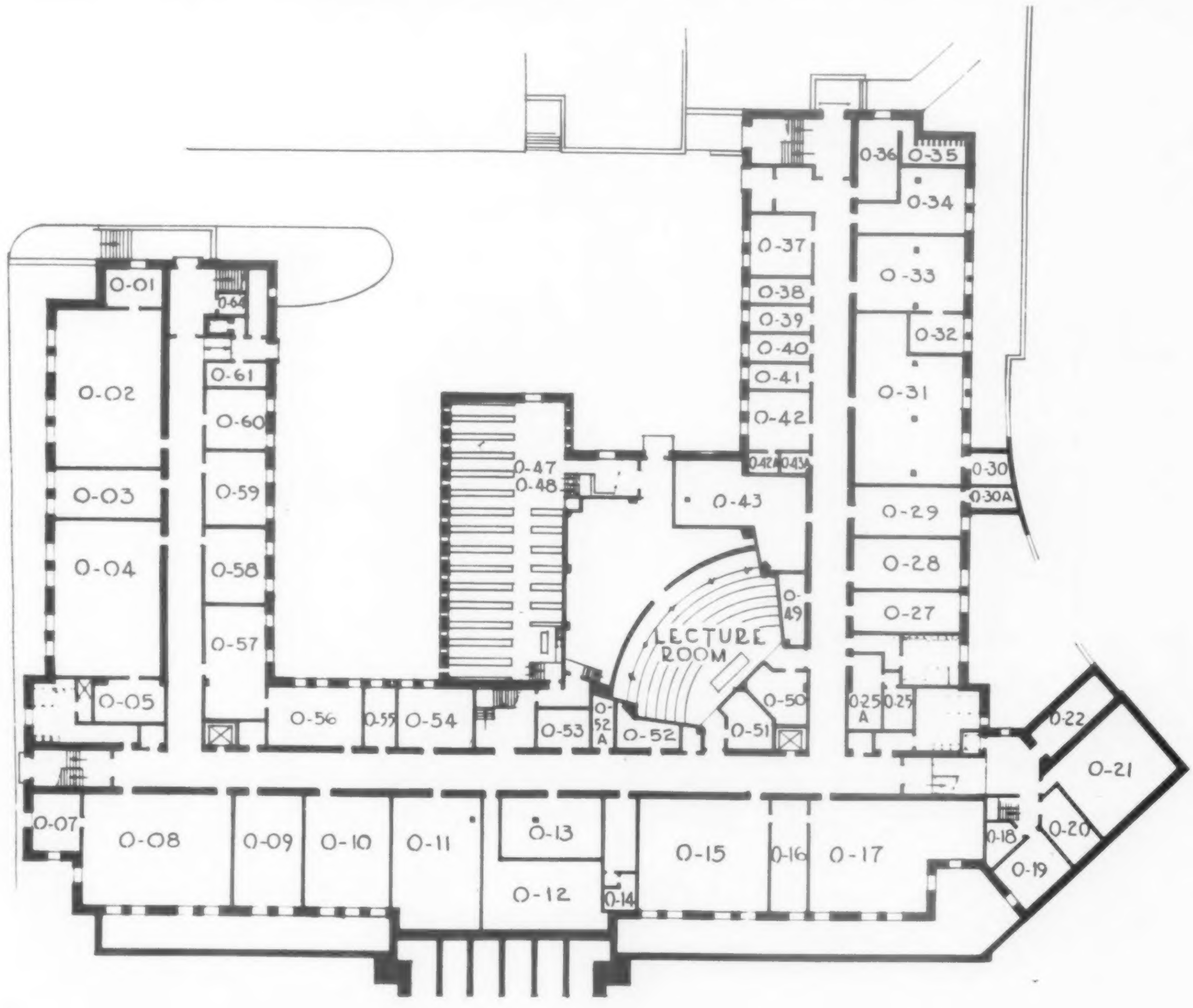
Certain fundamental principles were immediately evident. The two major facilities used by all four

departments are the library and the ampitheatre. Both are situated close to the main entrance for ready access. The amphitheatre will seat 337. Similarly, the faculty room is adjacent to the main entrance. The botany museum was selected also for prominent location on the main floor. The remainder of this floor is divided between the botany and zoology departments.

As Seen by the Plans

In a building project it can be said that nothing tells the story more clearly than the plans. There are perhaps exceptions to this dictum. Certainly it is true that the reasons for the allocation of space are not always revealed by the plans. On the other hand, it is especially true in the case of a building combining so many different facilities, that the plans are more revealing even than words. Accordingly the closest view of Indiana University's new building can be obtained by studying the plans.

We do realize, however, that the layout, of itself, does not show the infinite imaginative uses to which the building will be put. From the information that we now have we may assume that the study of genetics



BASEMENT PLAN

0 20 40 60 80 100
SCALE IN FEET

Zoology

0-01, 5, 7	Preparation rooms
0-02, 4, 8	Elementary laboratories
0-10	Aquarium
0-11	Fish collection
0-12, 51, 52	Storage
0-13	Constant temperature
0-14	Photo
0-53	Cold Room
0-55, 60	Graduate laboratories

Botany

0-15, 16	Elementary laboratories
0-17	Taxonomy and ecology
0-18, 31, 50	Storage
0-25	Dark room
0-25A	Studio
0-27	Curator
0-32	Glass blowing
0-34	X-ray
0-38, 39, 40, 41	Graduate laboratories

Bacteriology

0-22	Sensitive Apparatus
0-29, 43A, 49	Storage
0-30, 30A	Solvents storage
0-42	Electron microscope
0-42A	Dark room

Common rooms

0-47, 48	Stack rooms (library)

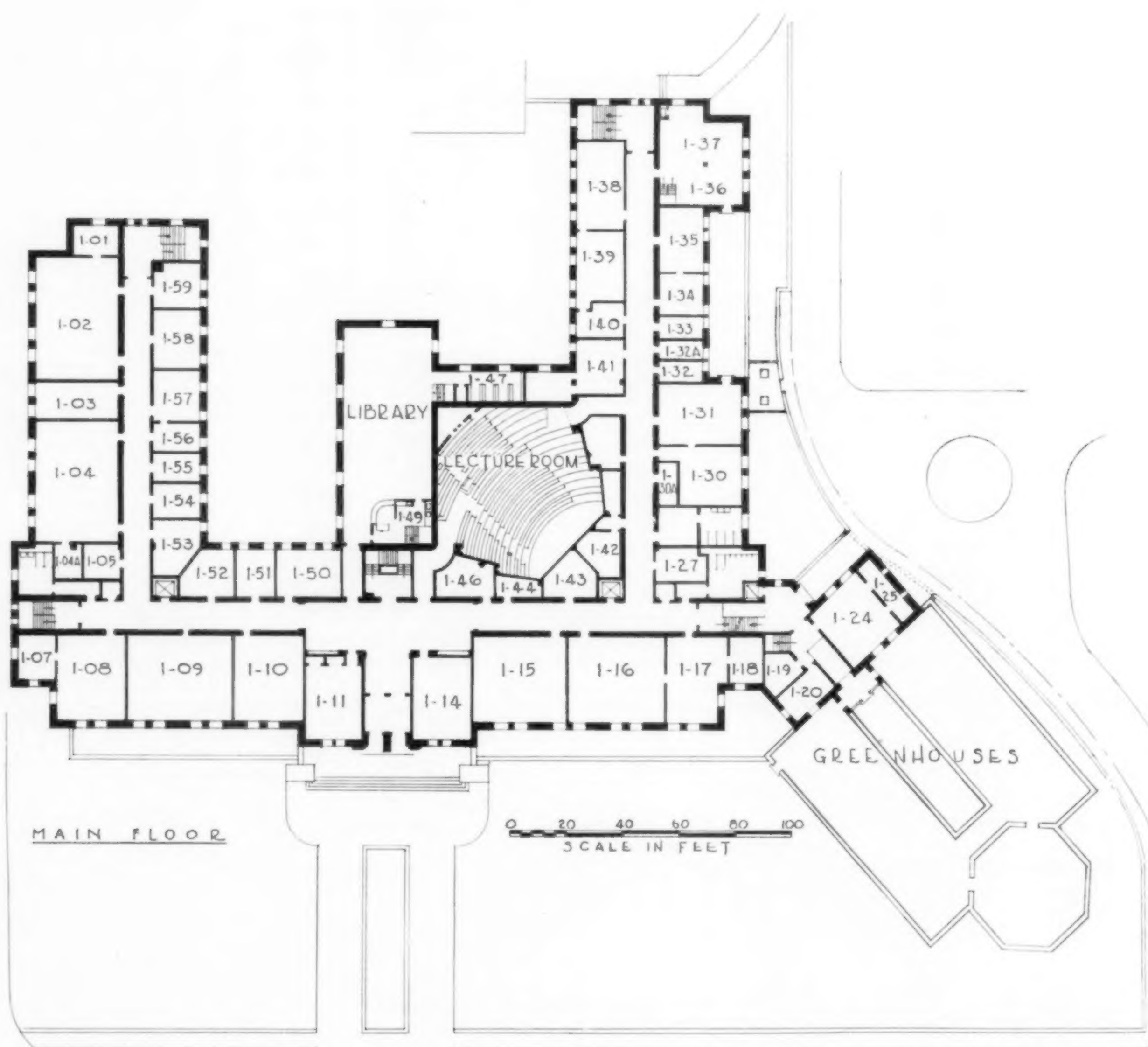
may be progressed more efficiently in the new building than has been possible in the past. To those familiar with the work now going on in the separate fields of science represented in the building we have no doubt that the relationship of facilities is self-evident.

A bird's-eye view of some of the interesting spaces in the building is revealed.

In the basement, the two major departments are zoology and botany. The zoology facilities include space for preparation rooms, an aquarium, a fish collection, a constant temperature room, a photo room, cold rooms, a reprint room, and even storage space for nets to be used for the daily catch of fish. Space allocated to the botany department includes rooms for toxonomy and ecology, a balance room, cold rooms, and constant temperature rooms. There is also space for glass blowing. Solvents will be stored underground, outside the building, yet with access both from the inside and outside of the building.

The bacteriology department will also have basement space. This will include a room for sensitive apparatus, an electron microscope, and a dark room.

On the main floor, in addition to the library and amphitheatre, space has been set aside for the botany



Zoology

1-01, 07	Preparation rooms
1-02	Embryology
1-03	Seminar
1-04	Comparative anatomy
1-08, 10	Advanced laboratories
1-09	Demonstration museum
1-51, 52, 53, 54	Graduate laboratories

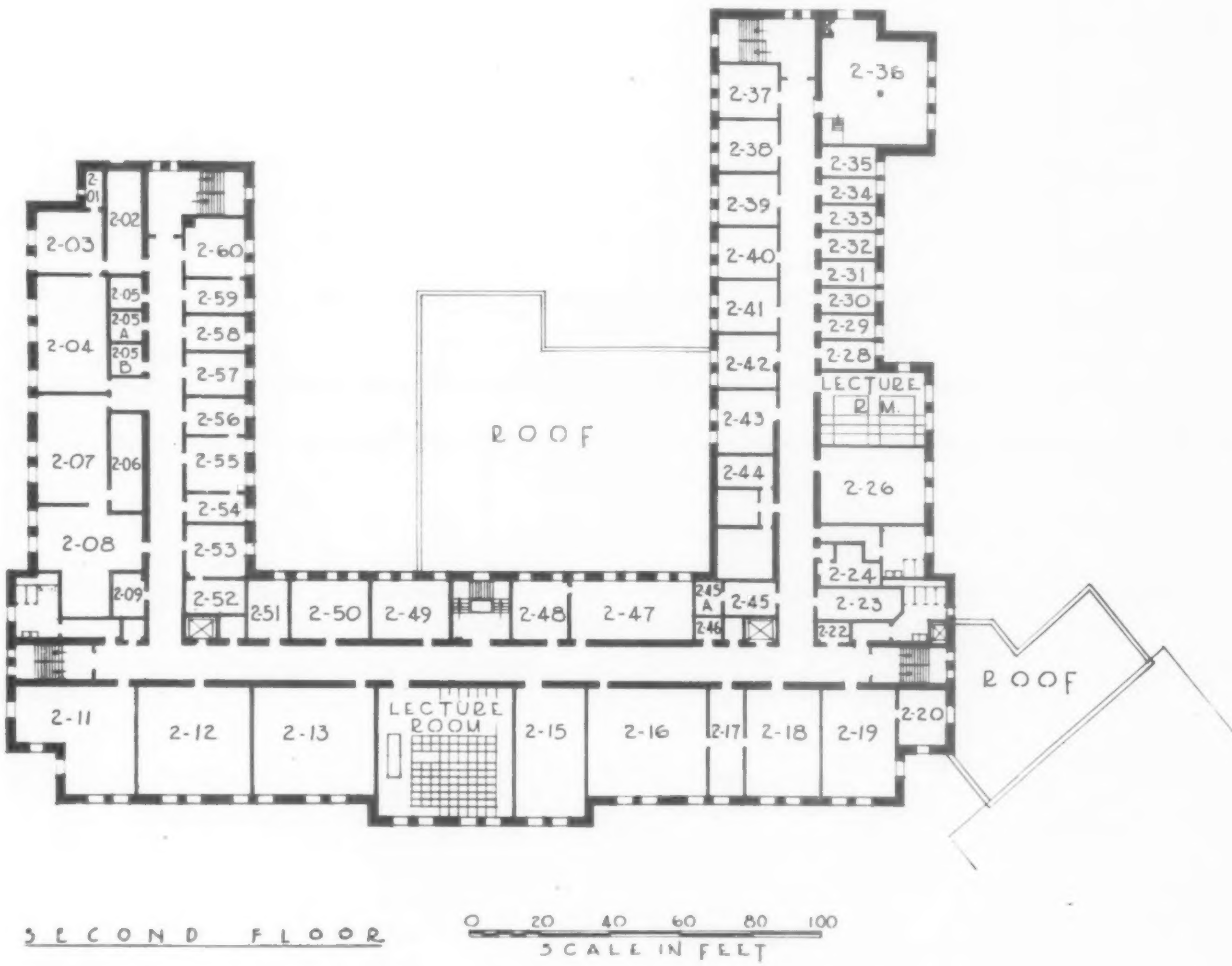
Botany

1-14	Museum
1-15	Elementary laboratory
1-16	Physiology laboratory
1-24	Potting shed and workroom
1-30	Media kitchen
1-35	Taxonomist laboratory
1-36, 37	Herbarium, 2nd tier

and zoology departments. For zoology there are areas for embryology, comparative anatomy, laboratories, a demonstration museum and other necessities. The botany department will have considerable space, including a media kitchen and preparation room, physiology laboratory, toxonomist laboratory, a herbarium, and other spaces indicated in the accompanying plans.

Off the main floor is a wing which extends to the east and which consists of greenhouses for student teaching and for display. It will be adequate for exhibitions and its facilities include a head house, an office, storage space, temperature controls and a piling shed.

Three departments share space on the second floor. These are the botany, anthropology and zoology divisions. On this floor are space allocations for graduate laboratories, constant temperature rooms, an autoclave room, and other necessary facilities. The anthropology section will include the museum for this department, space for skeleton storage, a workroom and an area for protozoology and genetics. The second floor botany area includes the micrology laboratory, the micrology preparation room, the media kitchen, micrology storage, a research room, photo and darkrooms and other spaces.



SECOND FLOOR

Zoology

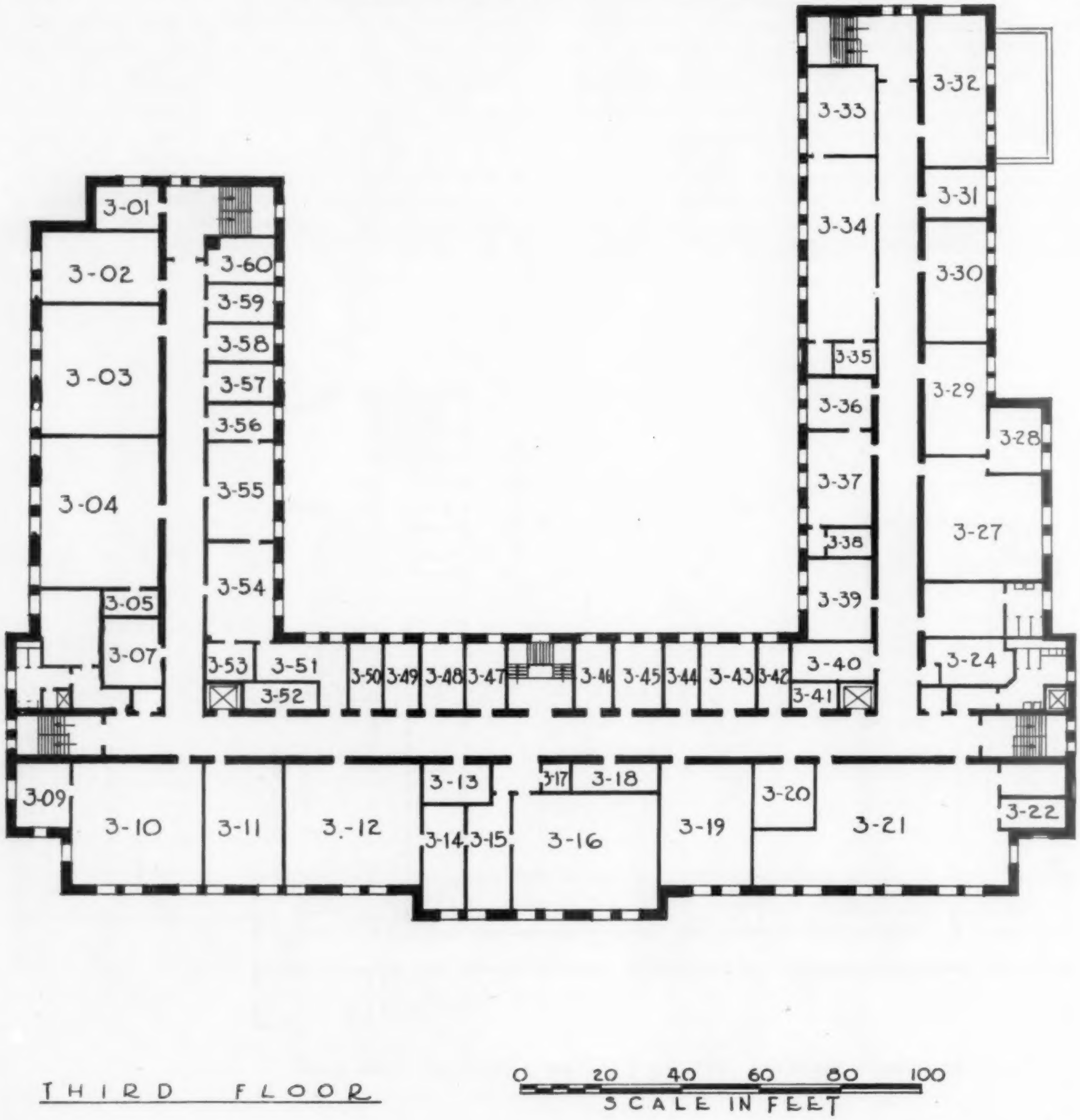
2-01 Autoclave
2-06 Constant temperature
2-22 Cold room
2-37, 38, 39, 40, 41, 42, 57, 58 Graduate laboratories
2-02, 47, 50, 53, 60 Professor's rooms

Anthropology

2-11 Skeleton storage
2-12 Anthropological museum
2-13 Protozoology and genetics
2-15 Anthropology workroom
2-49 Professor's room

Botany

2-16 Mycology laboratory
2-17 Mycology workroom
2-18 Media kitchen
2-28, 29, 30, 31, 32, 33, 34, 35 Graduate laboratories
2-36 Herbarium—3rd tier
2-44 Constant temperature
2-45 Photo room
2-45A Dark room
2-46 Cold room



Zoology

3-03, 04 Advanced laboratories
3-05 Storage
3-07 Insect room
3-10 Experimental embryology
3-13 Constant temperature
3-47, 48, 49, 50, 51, 54, 55, 56, 57, 58, 59 60 Staff

Botany

3-12 Anatomy and morphology
3-14 Embedding
3-15 Microtome
3-16 Cytology and microtechnology

Bacteriology

3-31 Stock culture
3-33 Sterile and media kitchen
3-34 Technique laboratory

The zoology department has considerable space on the third floor. In addition to staff rooms, there are areas for experimental embryology, a constant temperature room, and an insect room. Some of the space set aside on this floor for the botany department includes rooms for anatomy and morphology, embedding, microtome, cytology and microtechnology, cytology storage, and necessary office and research space. The bacteriology department's space, in addition to the chairman's office and laboratory, includes a lecture room and space for stock culture, constant temperature, a media kitchen, and cold rooms.

FOURTH FLOOR

Perhaps it is the recital of the facilities of the building which cumulatively reveals the breadth of its scope. The fourth floor is shared by the departments of bacteriology and zoology. The bacteriology department has space set aside for animal runs, sheep, dogs, rabbits, guinea pigs, mice, cats, isolation, laboratories, media, a dark room, and a balance room. There are, of course, other essential spaces.

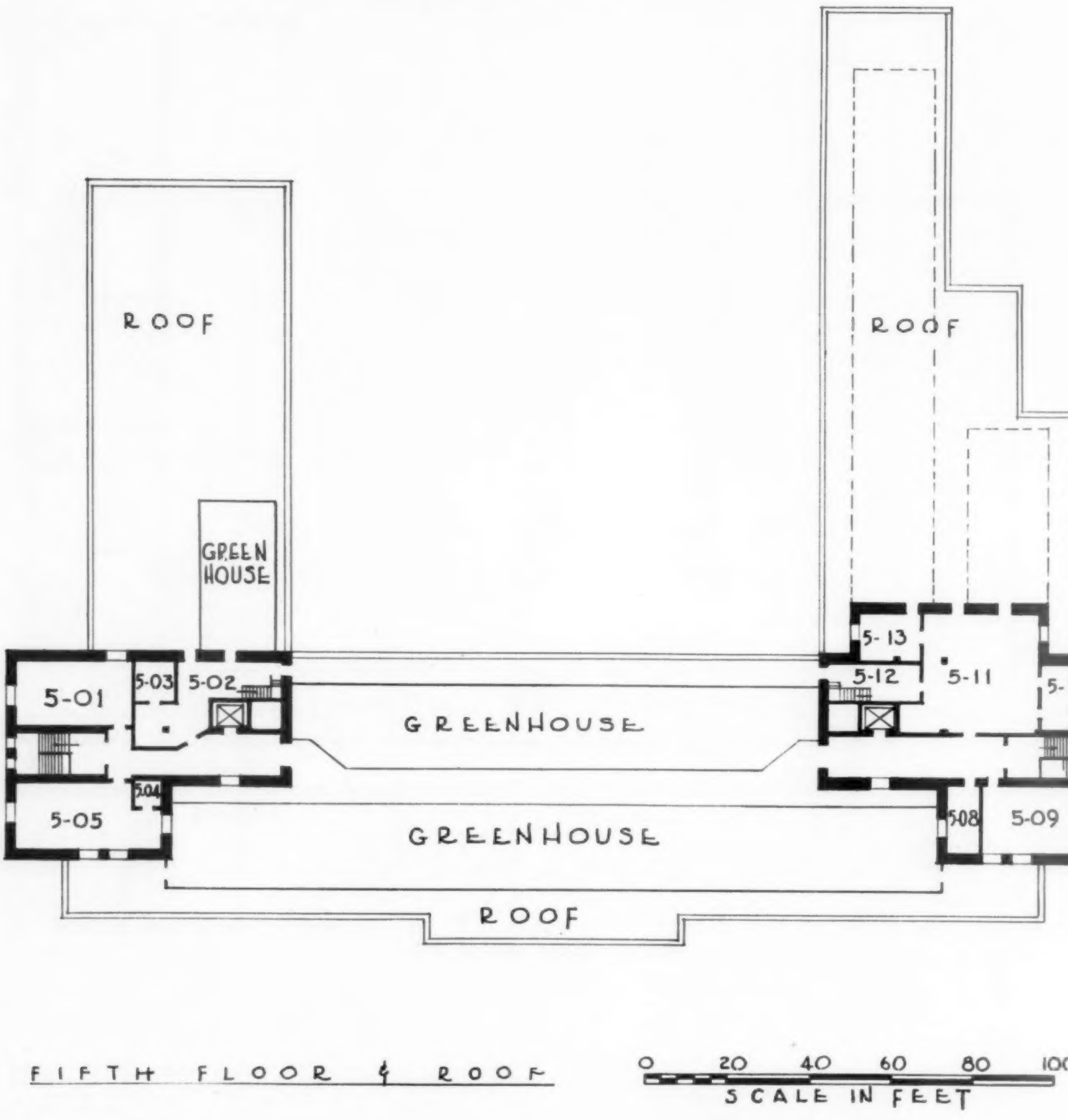
The zoology department on the same floor will have space for large chicks, dogs, rabbits, mice, rats, baby chicks, and operating rooms. There is also space for autopsies.

Bacteriology

4-06	Sheep room
4-07	Animal runs
4-08	Dog room
4-10	Rabbits
4-11	Isolation
4-12	Guinea pigs
4-13, 14	Mice
4-15	Cats
4-16	Injection and autopsy room
4-49	Cleaning and feeding room

Zoology

4-02	Dog room
4-50	Feed room
4-51	Staff operating
4-56	Baby chicks



The greenhouse dominates the fifth floor which is shared by the departments of botany and bacteriology. There is adequate work space in the head house, a cold box, a laboratory and constant temperature equipment. The botany department will have space for graduate work, a laboratory, bins and greenhouse space. The still, which will provide all distilled water necessary for the building, is also located on this floor.

Upon completion this structure will be an important unit in the increasing number of units devoted solely to study and research into the secrets of life, a field in which Indiana University has been making significant contributions in recent years.

Bacteriology

5-02 Head house
5-03 Cold box
5-04 Constant temperature
5-05 Laboratory

Botany

5-08 Graduate laboratory
5-09 Laboratory
5-10 Bins
5-11 Head house
5-12 Still
5-13 Office

PLANNING THE HARVEY FIRESTONE MEMORIAL LIBRARY, PRINCETON UNIVERSITY

By WALTER H. KILHAM, JR.

O'Connor and Kilham, Architects, New York City

Mr. Kilham is a graduate of Harvard and was awarded the Wheelwright Traveling Fellowship upon completion of his M. Arch. degree. He traveled in Europe and South America observing latest types of buildings and construction methods. In 1928 he became associated with architects on the Rockefeller Center project and in 1941, he was appointed principal architect in II Zone Construction Quartermaster's Office. He continued with the War Department until 1943 when his partnership with R. B. O'Connor began.

PRINCETON is a university with an enrollment limited, prewar, to 2,650 students, of whom 250 are graduates. At the time these plans were started the various libraries contained from 800,000 to 900,000 volumes, most of which were in the central library building.

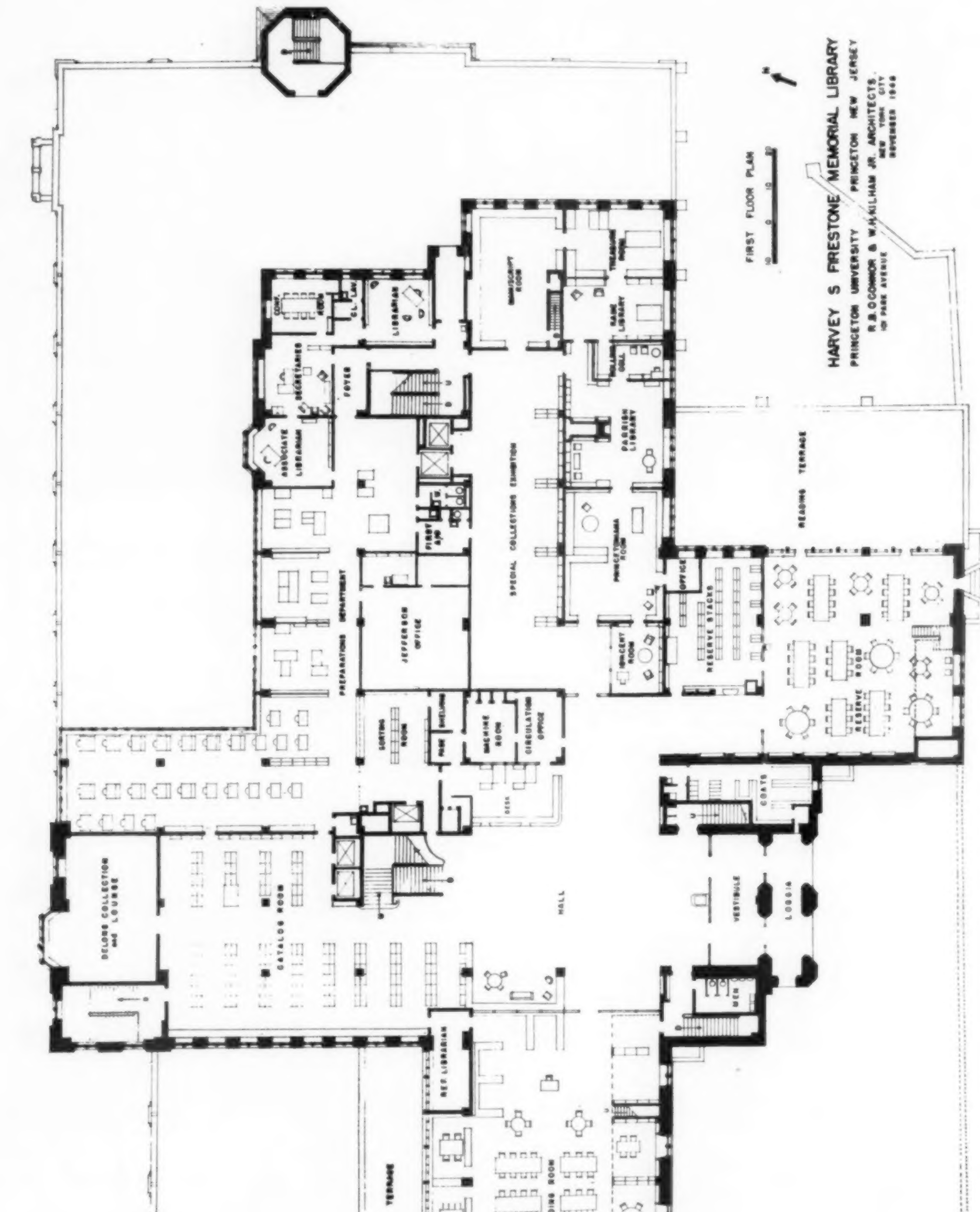
The existing library, built in 1873, had long been outgrown and various plans and schemes for a new building had been prepared, some fairly complete, in the search for a type of library that would be adaptable to the particular educational needs of Princeton. In brief this aim was "to induce the student to work for himself." The object of all the library plans was to bring together, harmoniously and in one place, the faculty, the students, and the books, particularly in the fields of the humanities and social studies.

It was a characteristic of the earlier plans that they emphasized the departmental idea, resulting in the assignment of definite sections or wings of the building to major departments. Locations were determined by the accessibility of the stock classifications of the various subject-matter fields. It is in departing from the sectionalized scheme that the present plan differs from its predecessors.

Although the war interrupted the continuity of studies, the trustees determined to proceed with the building of the library at the earliest moment. In the meanwhile they reached two major conclusions.

The first was that any new plan should be flexible. They noted that, although the aim through the years had been the same, the plans were always changing—none of them seeming to answer the problem by the time it was done. Therefore, they wanted the library constructed with open floors and interchangeable partitions, like the true "laboratory library" it was supposed to be. In this way it would be possible to meet changing needs.

The second was a purely architectural requirement.


HARVEY S FIRESTONE MEMORIAL LIBRARY
PRINCETON UNIVERSITY PRINCETON NEW JERSEY
FIRST FLOOR PLAN
SPECIAL COLLECTIONS EXHIBITION
JEFFERSON OFFICE
PREPARATIONS DEPARTMENT
CATALOG ROOM
HALL
VESTIBULE
LOGGIA
COATS
MEN
RESERVE STACKS
RESERVE ROOM
READING TERRACE
REFERENCE READING ROOM
REF LIBRARIAN
SORTING ROOM
MACHINE ROOM
CIRCULATION OFFICE
MANUSCRIPT ROOM
FOYER
LIBRARIAN
ASSOCIATE LIBRARIAN
SECRETARIES

A generation had worked to establish the present character of the campus based on Gothic architecture, generally of a residential scale. The new library was to be adjacent to the beautiful chapel by Ralph Adams Cram. The trustees did not dictate the detail, but they did expect the new building to be in scale and harmony with its surroundings. At first this might have seemed a handicap to functional design, limiting the plan by considerations of the exterior, as such requirements had done so often in the past. The Building and Grounds Committee, however, was just as anxious to have a building suited to its purpose and, to their credit, agreed that the plans should be developed with the library and faculty committees to a satisfactory solution before studies of the exterior were submitted to them. This was certainly a double-barreled challenge to the architects.

Basic Principles

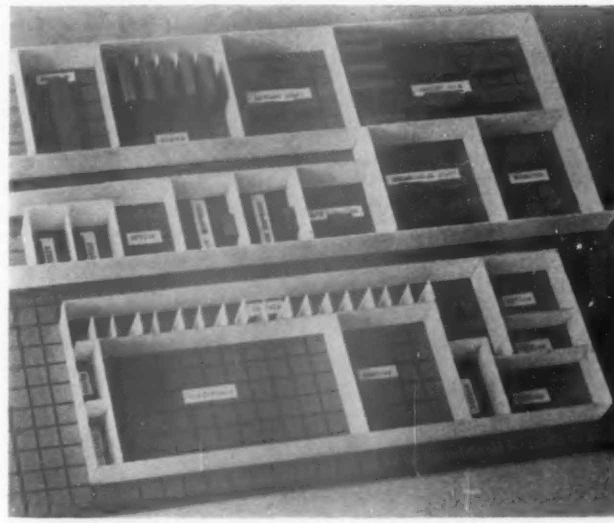
Work started with a series of meetings with the Faculty Committee for the Library and the Committee on the Course of Study to determine the basic principles to guide the architects in their planning. First, the idea of flexible space was demonstrated by a little model consisting of a board with checkerboard slots (above right). In these slots strips of cardboard, scaled to partition height, could be inserted to represent rooms on a modular basis. It was explained that, with office type sectional partitions, spaces could be sub-divided as easily as on the board. Such space could also be used for stacks.

The discussions themselves were illustrated with diagrams on sheets of paper about 20″ x 30″—large enough for all present to see. The first diagram brought out the elements to be considered in bringing together the faculty, the students and the books. It was clear there was to be a great deal of seminar and study space in the library.

The second diagram presented the fundamental differences of an "open" and a "closed" stack (of books). By an "open" stack is meant one to which both faculty and students have freedom of access, if they so desire, to do their own searching for books. By a "closed" stack is meant one which, in principle, is under the control of the librarian who delivers the desired book to the circulation desk (as determined by the use of the catalog and requested by a call slip). There is much to be said both ways, but it was agreed the open stack would seem to meet the Princeton conditions more completely. The architects kept in mind, however, that the policy might change in the future, and nothing prevents the library's being arranged to run on the closed-stack principle.

The next problem was the general relationship of stack space to seminar space assigned to departments. There were several ideas:

1. Location of seminar space in a separate part of the building (diagrammatically shown above the stack).
2. Provision for a so-called "suck-up" from the stack of books desired by any department into the space assigned to it. This was, naturally, an effort on the part of those believing in departmental libraries to recapture the ideas in the pre-war plans. Major disadvantages were that shelving a book in two places would result in waste of space and in waste of time, and would defeat the purpose of the library which was to keep all books available to everyone and not just to a small group.
3. Distribution of study space throughout the building so that each department could be as near as possible to its particular classification of books.



Scale model used for demonstrating space sub-division.

The committee decided on the first—an area of seminar rooms in a separate section of the building. It is interesting to note, however, that as the plan developed, this idea underwent a radical change.

A third diagram illustrated methods of control. It was concluded that responsibility for checking a book through the desk would fall on the user. Within the library any book without the proper pink slip would be picked up and returned to the stack by one of the pages who would circulate through the study areas and carrels periodically. At the start, at least, there would also be an attendant at the main entranc to the building to check the books of all those leaving the building. Staff members only would return books to the shelves.

The implication so far had been that there would be one common stack, equally accessible to all. Diagrams illustrated this in comparison with departmental grouping of books—the latter being quite feasible for small collections like oriental languages with 1,330 square feet of books, but not so practical for history with 16,300 square feet.

In general, the acceptance of the principle of a common stack was difficult to accept for many of the older faculty members who had enjoyed the privilege of having their books gathered around them. However, it was realized that the library was growing, and that classification of a book was a cataloging expedient which didn't necessarily determine whether it was history, politics, economics, or all three combined. Furthermore, with the broader educational system, some students might be encouraged to search for books outside the limits of departmental classification if there were no physical barriers imposed.

There were many other questions examined and they all boiled down to these first principles:

1. Freedom of building and stack with control at entrances.
2. Separation of book area from seminar area (to be later modified).
3. Provision for students and faculty to work in the stack area.
4. Unassigned study area to be provided—reading rooms, browsing areas, etc.
5. Sub-division of seminar space into "work" and "talk" areas.

By this time it was possible to estimate the total amount of space that would be required and how it would compare with requirements of prewar plans. With rising prices looming on the horizon, it was felt the cubage should be reduced by 25 per cent, a very optimistic view in light of present day building costs. One approach to the problem of reducing the space was to obtain detailed requirements and suggestions by departments.

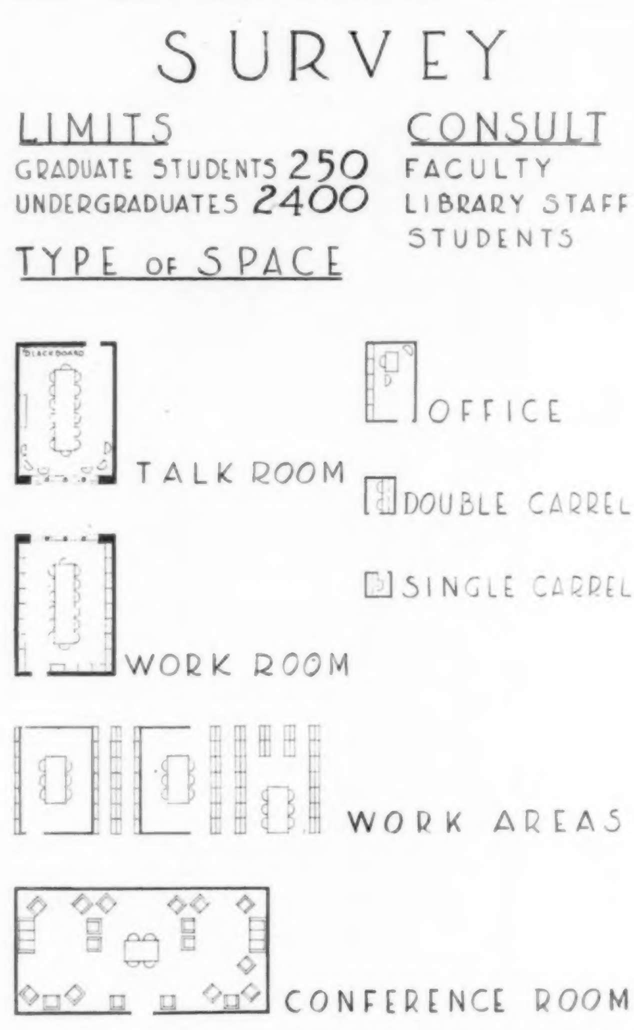
It was realized that to make an effective survey some reasonable limits would have to be established, particularly with reference to modular or flexible space available.

Referring to the old system of seminar rooms, someone said it was difficult to work and talk in the same room. So it was agreed that, in the new plan, "work" and "talk" spaces would be recognized. A "work" space was a room where a department might have assembled on its shelves the "tools" necessary for the particular studies carried on therein. For example, in the French workroom would be the various dictionaries, encyclopedias and standard reference books required by this department. Here a boy needing the use of these aids could come and do his work without hunting all over the library for them. Adjacent would be the "talk" room where professors could get together around a table with small groups—twelve or sixteen—and discuss their work on the conference system. Recognizing this seminar space as one of the important ones, it was used to determine the bay size or space between columns—roughly 18 x 24 feet. The 18 foot dimension was determined by the 4½-foot (times four) customary spacing of stacks, and the 24-foot dimension by the multiple of 3-foot stack shelf units. Combined columns and ducts were to fit within an envelope of 2′ x 3′, thus displacing one stack unit.

Half a bay, or nine feet, was accepted as a typical office. Two or three bays would give a lounge room.

Carrels, or cubicle study units, were of two sizes, each 4½ feet wide. The standard for students is approximately 4½ feet long, somewhat larger than usual, and the faculty type was 6 feet long so that an extra chair may be placed there for the boy who comes for an individual conference. It was agreed that few offices would be provided in the library for faculty members, but that there would be a sufficient number of larger carrels to give many more faculty members an opportunity to have a "home" in the library.

The customary reference and reserve reading rooms were to be provided, but limited to 200 and 100 seats, respectively, in view of the amount of seating throughout the library. Besides these rooms, there were to be so-called "browsing" areas—oases of two to three



seats scattered throughout the stacks so that one could have a chance to glance through a book without returning to a carrel or study room.

Finally, it was made clear that the University enrollment was limited, which meant that expansion of any department would be recognized only by the reduction of another.

During the next month or so, the architects held some thirty interviews with the various departments. It was an excellent opportunity for them to get acquainted with the University and its functioning, as well as to learn what demands might be made on the library.

Upon the completion of the survey, the space requests were totaled. The architects were glad to see that some progress had been made in reducing the total through these discussions, but it still was not enough.

Stack space had been allowed for 2,000,000 volumes, more than doubling the current number, which meant that for some years much valuable space would be unused. Since the spaces were interchangeable in use,

it was clear the step so dreaded by librarians would have to be taken—encroachment on stack space. Educational spaces were assigned along the outer walls of the stack area.

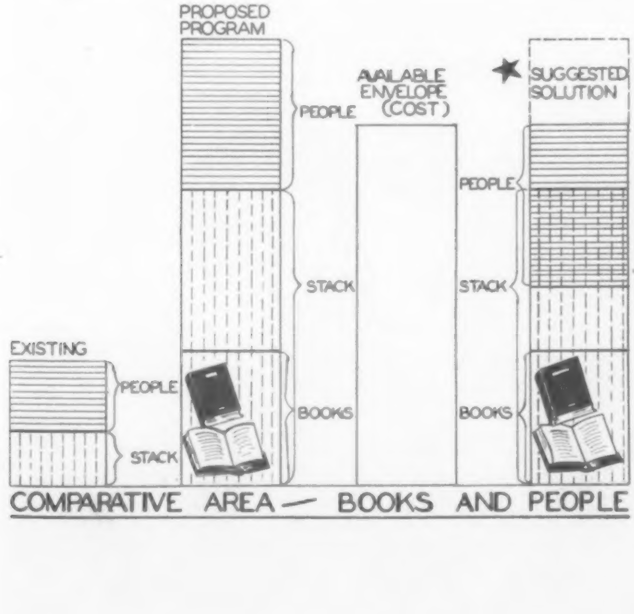
While the stack area was to be constructed for 2,000,000 volumes, it looked as though the available space for books within it was being reduced to 1,534,000 volumes. It should be noted that in figuring capacities, 25 per cent above of stack space the net figures quoted was allowed for "shelving."

It was now time to discuss with the original Committee the type of library plan with relation to their own particular problem, again with the use of diagrams. First the "central" stack scheme seemed unsuitable because of the difficulties of expanding the stack. This also applied to the so-called "divided" central stack, a means of giving departmental access to a centrally controlled stack. The "rear stack" type was expansible but better adapted to departmental libraries, and we had modifying ideas due to the sloping site. Considering the site, the common stack, and separated seminar spaces, with independent expansion of each, it was agreed that a plan with study areas superimposed over the stack seemed most suitable, influenced in part by experience with the prewar plans.

Naturally cross-sections were considered at the same time. The important thing seemed to be to provide direct access to the circulation desk with the desk as near the center of the library as possible. At Harvard's Widener Library, access to the circulation desk at the center of the building was provided by a long flight of steps outside and another inside. At Yale, the problem was dodged by entering the bottom of a tower stack. The plan of the University of Virginia, as well as Princeton's 1940 plan, seemed much better, with students entering from the campus at a center level and going up or down into the library.

The cross-section of the building site showed the slope down to the Nassau Street side of the campus, indicating it might be possible to enter the main floor at an intermediate level. (The lowest level on the diagram was later abandoned since it would not allow outside light even on one side.) The section also shows the height of adjacent buildings with which it was important to keep in scale. The diagram brought out, too, the location of the hard rock, sloping with the surface. To avoid digging too far into this on the uphill side, the lowest level was cut back at this point, resulting in a smaller floor.

Diagrams of allocation of space were then made—first one with seven levels, and then another reduced to six. This program was approved, including its implied cubage, and the architects were ready to concentrate on the actual plans.



COMPARATIVE AREA — BOOKS AND PEOPLE

Plans

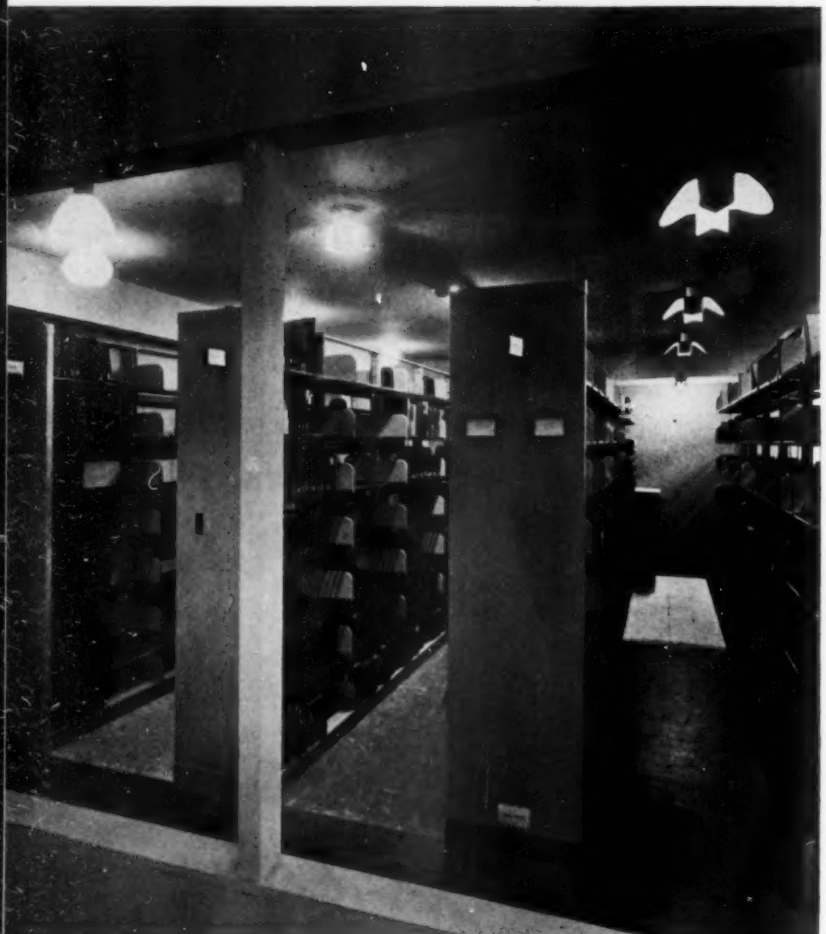
Naturally, planning was not at a standstill during the period of developing the program and much progress was being made on considerations of factors of the site.

As previously noted, the site sloped down to Nassau Street on the north. Up from Nassau Street on the east was Washington Road with college buildings on the other side. On the south was the dominating chapel on the easterly sector, and the open campus to the southwest. It was obvious that the building should open to the campus. On the west was the rather handsome dark sandstone building of the old library. Between the chapel and the site was a campus road. It was early decided to discontinue the road for a number of reasons, and its elimination gave the architects a better chance to make a composition with the chapel and the old library.

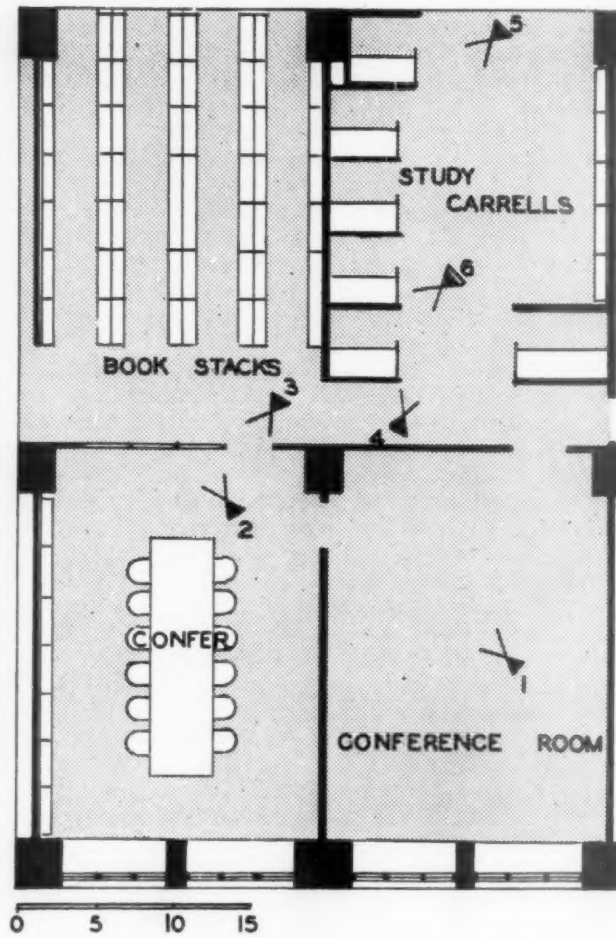
Next was the question of expansion. It was agreed that room should be left on the site for doubling the size of the library. Since it was to be a memorial building, or what architects call monumental, and the front was logically to the south on the campus, it seemed reasonable to build it on the south side of the lot. In this way the principal facade would be permanent and any future alterations due to addition would be away from the campus. Also, considering south light to be the least desirable for reading, there would be more freedom to treat the exterior architecturally on this side.

The trustees suggested building a wing along Washington Road, opposite the Engineering Building, but there seemed to the architects to be several reasons against this. In making our survey of the faculty we asked many questions about light, orientation, etc., and from this we found that those now with space on Washington Road were much disturbed by trucks shifting gears on the hill that continued by the east side of our site. Obviously to put a wing on the other side of the street would, in principle, make an echoing canyon in which the noise would be increased. In any case it was not a desirable place for library rooms. Furthermore, to come so far east would cut off the view of the apse end of the chapel with its handsome flight of steps and memorial arch. Still further, by letting the ground break in around the building from the street, the college buildings on the other side would still see into the campus and feel part of it.

As the stacks would be below the main entrance level, we felt the floor areas could be large without being disturbing in appearance. From the librarian's point of view, the larger the floor area, within reason,



Stack lighting fixtures under consideration: first row, prismatic incandescent (efficiency and economy); second row, shielded fluorescent (best light but expensive); third row, incandescent (economical but with glare).



Below, bay set up as model departmental conference or seminar room. Wall shelves will contain books used continuously. Experimental flooring here is half random wood plank, half parquet squares.

Experimental carrels have been equipped in full detail. Various types of lighting are fluorescent tube beneath book shelf; prismatic incandescent overhead fixture, drop-cord fixture, fluorescent fixtures at back and to left above student. In close-up, adjustable fixture and overhead combination are currently favored.

the easier it was to classify books, allow for expansion within a classification, and use book trucks. This stack would then serve as a base for the three-story building above, which would be in scale with the surrounding buildings.

This upper part could be arranged to form a court to the southwest with the old library and the chapel; then with a flight of steps to take care of the change of level, a lower court would open out to the southeast.

As the slope of the site to the north, particularly at its westerly end, was not going to be sufficient to bring light in all north windows of the stack area, it was decided to cut away the bank here on an easy slope down to the building, and the excavated material used to level the fore court. Such were the general conditions affecting the exterior.

In laying out the interior plan, the major consideration was the main floor which would house the primary library functions: circulation desk, catalog and reference rooms. Since the catalog is used as much by the staff workers as the public, it was decided that the Preparations Department should be adjacent to the catalog room. The Reserve Room, limited to one hundred seats, was also kept on the main level as it was not very large and there was some feeling that it might eventually be discontinued and the space used for other purposes. To ease up on crowding the entrance in the morning, a return slot for books was to be arranged to open to the outside of the building.

Perhaps it should be said that from this time on, the details of the plans were developed with the librarian and his staff whose experience and suggestions were invaluable.

The circulation desk was to be located so that it would control the entrance to the stack stair, based on its location controlling the stack in the old library, and oversee the entrances to the reading rooms and the catalog for information purposes. Considered the most important, the catalog was arranged on the axis of the front entrance and thus had the advantage that it could expand on its own axis if the building were increased. Half of the Preparations Department was placed parallel with the catalog space for direct access. The balance continued at right angles down to the freight elevator which gave access to the truck entrance on "B" level. In this way, new books would be processed through to the sorting room behind the circulation desk. This sorting room was also the place where returned books from the desk collected. From this one place all books could go to the stack. The book carriers, pneumatic call tubes and elevators went through all floors.

Another feature, and an important interest of the librarian, was the special collections which grew rapidly as it became certain there would be a new building. This section took up the southeastern part of the main floor with a gallery for changing exhibitions and a series of rooms generally donated for special purposes, such as Manuscripts, Princetonia, Parrish Library, etc. Elevators were located in this section, as well as at the main stair, so that special collections could be controlled independently, if desired, and expand over other floors. At present it extends to the stack below and the floor above.

As stated, the lower levels, now called A, B and C, were indicated as open floors principally for stacks. The upper floors were arranged as wings since they would be used chiefly as classrooms and offices and should therefore be relatively narrow to give light on two sides. Columns of the stack area, however, were designed to take independent expansion of the upper floors.

This plan seemed to be acceptable to everyone and was about to be adopted when the librarian felt that too much book space was being sacrificed and too much emphasis placed on educational space. At the zero hour a solution was reached. The upper floors were to be widened by one whole bay so that even if educational space took the windows, there would still be considerable space for books in the center. Actually this was a far-reaching step and a most important one, for now it was but a step to making the library a unit throughout and a true "open stack" library. More than this, the departments could be given practically all the advantages they had in the old departmental library.

With storage of books in reasonable quantity on the upper floors, a new revised plan of stack allocation was possible. It was realized that certain departments, such as classics, had relatively few books, while history, for example, had hundreds of thousands. If then the classics department were to be moved onto an upper floor, its seminar space could be adjacent to its books. Similarly, history seminars could be moved down to the big stack areas adjacent to the history book classification. This created more space above, and in a short time things began to slip into their logical places with small departments or special subjects in the small part of the building and the large departments down with the large stack areas.

We had long since committed ourselves to a modular library with interchangeable space. Everyone is familiar with the self-supporting stack with struts 4½′ x 3′ on center. Before the war, the Annex to the Library of Congress had gone to a bay 4½′ x 10′ with ventilation in the columns. Large bays had also been worked out at Greeley, Colorado. The 1940 Princeton plans had a bay roughly 10′ x 10′ with ventilation in the columns. Now the Snead Company and the University of Iowa were working on a bay size about 18′ x 18′. We had already decided we would like a bay big enough for a seminar room about 18′ x 24′.

It was assumed that the stack floors would be worked out in some form of stack construction which meant light floors and exposed steel. Still looking for ways to save money, however, we came to the conclusion that at the current market we could build typical office or loft building type floors and stand bookcases on them for less money than stack construction would cost. We would gain the tremendous advantage of having fireproof floors as well as standard construction. This decision was most fortunate. Hardly was the building under way when we found steel was unobtainable in time and we had to change the lower three floors to reinforced concrete. The sheet steel for stack construction was even further out of sight than structural steel. Incidentally, the change to concrete indicated a saving of $60,000. The librarian asked that this be put into additional stack bays, which was done at once. Nobody saw the gathering clouds of rapidly inflating prices on the horizon.

In working out a decision on the exact size of the bay, we had originally constructed a full size model or "mock-up" of four typical bays of the library. Here we were able to set up the various details we had talked about. One bay had book stacks by different manufacturers. Several carrels were built up of studs and plasterboard to work out the relative sizes. A workroom and a talkroom were set up in the remaining bays with a unit partition between the two. Actually, during the lunch hour of a conference of visiting librarians, this partition was removed as a demonstration of flexibility. The new space was the size of a lounge.

One important use of the mock-up was to determine the ceiling height. The typical stack height is about 7′ 2½″ to 7′ 6″. This seemed too low if the space were to contain seminars and offices; also it would be too low to distribute light easily, and ventilation would be difficult. We worked out a ceiling height which we thought would meet all reasonable conditions, but since we didn't want to be prejudiced in its favor, the mock-up was designed with a movable ceiling over two bays. The Faculty Committee was then invited to see the model with the ceiling at 7′ 2½″. We said we knew it was too low, but wished them to say when they thought it had reached a reasonable height. It started to move up. They agreed with us on a height of 8′4″, and everyone was pleased. This established the stack height in the lower levels. Above the main floor, greater heights were used as the sky was the limit and not bedrock.

In the "mock-up" all kinds of lighting fixtures and methods were tried out. Many experts came to meetings at the model and gave their opinions. Two similar rooms were set up, one with fluorescent lights in accordance with popular desires, and the other with incandescent, to an equal intensity. It was interesting to see that, without exception, when so presented, incandescent lighting was preferred. With the budget now a serious matter, the choice of this more economical fixture was important. Of different fixtures, we eventually chose the so-called ring fixture using the silver ray bulb, although it is, perhaps, not the most efficient. The reason was that it gave indirect light without collecting dust and could be relamped from the bottom without the interference of a shade. On the difficult problem of lighting the bottom row of books in the stacks, no satisfactory fixture was found and it was concluded that reflection from a light-colored floor would be the best solution, in combination with a lens type shade with an incandescent lamp.

We barely had time to work out small scale elevations for our plans when the Trustees decided to proceed with construction without waiting for the working drawings to be completed. The object was to have certain major contracts, such as steel, let before the rise of prices that now seemed a certainty. This meant selecting a contractor on cost plus a fixed fee rather than by competitive bids; the indications are now that this decision has proved more economical. Of six companies interviewed, the Turner Construction Company was selected and excavation started. It is to be noted here that although the desires for a Gothic exterior were observed, the Trustees did not require a single window to be changed or reduced. The reference room remained all glass on the north side and the work areas have continuous windows.

Many desired products were unobtainable; many selected had to be abandoned because of too high cost. When it is remembered that every column contained ducts it was no simple matter redesigning the lower stories in concrete instead of steel so that every bay would be ventilated and still fit the module. The result was a continuous flat slab design with a split column so the duct could come up inside. Carrels and partitions were worked up with a newly organized company, bit by bit, until satisfactory full size units were approved. Book stacks went through the same process until one was obtained that didn't require crossbracing in order that folios might be laid through the shelves. Many lighting fixtures started with cardboard models and ended with agreement on an approved model. The carrel light was first built of wood by Mr. Duffield, the Assistant Librarian.

Even the combination lock for the carrel door required a new invention so that a boy couldn't be locked inside by a mischievous fellow student.

But such details as these will continue to develop until the building is done. Constant planning of individual areas continues and policy questions are settled by a "Committee of Three" consisting of the Vice-President, the Dean of the Faculty, and the Librarian. There is still much that might be told, but the building is well on its way and it is hoped it will be ready for use in the Fall of 1948.

Addendum

To summarize briefly, the building is approximately 350′ long by 225′ deep in the main stack floors, and is six stories high. Approximately 50 per cent of the building bays are book stacks, 11 per cent carrels, 12 per cent work areas and offices, 9 per cent staff, 11 per cent service, 3 per cent in main reading rooms, 2 per cent lounge space and 2 per cent exhibition space. About 75 per cent of the building is in "flexible" space, and of the flexible space, two-thirds is now in book stacks. Under the present plan, there is probably room for 1,800,000 books, with provision on the site for doubling the stack area in the future.

There are 319 seats in the two main reading rooms, 42 in browsing areas, 375 in seminars and faculty offices, 135 in special collections, 238 in lounges, 500 in assigned carrels, miscellaneous seating (industrial relations, public administration, etc.) 82, plus 200 folding portable chairs—a total of 1,891.

There is approximately 300,000 square feet of space in the building, and 3,870,000 cubic feet.

THE PLANNING PROCESS BEHIND THE BLUEPRINT

By ROBERT E. ALEXANDER, A.I.A.

Executive Architect for the University Elementary School, a Laboratory of Education at U.C.L.A.

Born in New Jersey, Mr. Alexander took Greeley's advice soon after his Cornell graduation and became actively engaged in divers architectural projects in California. In 1939 he returned East to participate in the Parkchester housing project. After fulfilling commissions for several California firms and serving as an Executive Assistant at Lockheed Aircraft, Mr. Alexander opened his own office in Los Angeles. He is the author of numerous articles and is President of the Los Angeles City Planning Commission.

"HOW DO you make the blueprints?" When a naive client asks this question, justifiable homicide is done with a blunt drafting instrument. Many an architect has wished for a blueprint machine which would roll out a design at the turn of a crank, but few architects have disillusioned the public by describing the planning process. A blueprint is a reproduction, the gestation period of which often rivals that of *homo sapiens* in difficulty and duration. For the mutual benefit of school client and architect, we have been asked to describe this period and the labor which accompanies it.

The University Elementary School is the laboratory school of the Department of Education, University of California in Los Angeles. It is a school where teachers learn to teach. For many years it has been located off the campus and housed in "temporary" bungalows totally inadequate and unsuited to its purpose in every way. The location and lack of physical facilities limited the program of the school so that past experience seemed inappropriate as a guide for planning a new plant. Therefore an evaluation of the entire institution and a creative report were needed to determine whether the school should be continued at all, and if so, what its functions and objectives should be.

Preliminary Steps

Long before the architect was appointed, a survey committee was directed to report to Dr. Edwin A. Lee, Dean of the School of Education, on the history, functions, organization and administration, professional personnel, curriculum and achievement of pupils, graduate teachers, and the school plant. This committee consisted of Lloyd N. Morrisett, Professor of Education, U.C.L.A., Director of the Survey; Frank N. Freeman, Professor of Education and Dean of the School of Education, University of California, Berkeley; John A. Sexson, Superintendent, Pasadena City Schools; and Frank W. Thomas, President, Fresno State College. They delivered their findings and recommendations in a superb 250-page report which furnished the essential background and direction for a building program.

Although this report named the major building elements required to meet the new school needs, it did not attempt to analyze the space requirements. A Building Program Committee was appointed to translate the report recommendations into a specific list of spaces and areas. Dr. Morrisett served again as chairman of this committee, which included the following members: Harry Hoijer, Professor of Anthropology, representing the parents of school children; Katherine L. McLaughlin, Professor of Education, representing teacher training; May V. Seagoe, Associate Professor of Education, representing research in education; and Corinne Seeds, Principal of the Elementary School, representing the staff. Dean E. McHenry, Associate Professor of Political Science, served during Dr. Hoijer's absence in Europe.

Their complete and specific report identified the spaces needed, and gave the number of pupils served,

space dimensions and areas required. The report was well organized into groups of related spaces, and mentioned auxiliary areas needed. Similar committees should bear in mind the difference between net main areas and the area of the total plant. Walls, storage, corridors, toilets, etc., usually add fifty per cent to the net inside space needs. Budgets must provide for the gross areas required.

Although an architect could have assisted this committee, it is important to note that programming is primarily the client's responsibility. The client can perform superbly, as ours did, or he can entirely neglect his function, as many do. In our opinion the client is the most important factor in the success of any construction. His aims, ideals, ability, and performance in fulfilling his functions make or break a project before it is designed. In the subject case, the client's outstanding work so far described was just a beginning.

The Architect Studies the School

After legislative action authorized a portion of this program, the Executive Architect was appointed. We set about our design task not by drawing, but by intensive reading, study, and observation. The architect not only observed many classes in action, but enrolled his own children in summer sessions. His wife assisted the principal during one summer and became a member of the parents' organization. This intimate experience has made a vital contribution to the planning solution. University students had made detailed written observations describing the complete operation of many classes and projects in the school. These narratives, the Survey Report, the Space Needs, and a large selection of magazine articles led to numerous questions which we believed should be answered by the school staff. Before meeting with the Building Committee we asked the chairman to prepare an outline of the functions and objectives of the school. This was accompanied by a description of school activities or "Curricular Experiences" prepared by Miss Seeds, the "Space Needs" prepared by the committee, and an extensive questionnaire prepared by the architect.

Although architects' questionnaires are plentiful, we made no reference to any checklist or similar work, but composed and classified the questions according to the problem. Some questions were naive, and some intentionally "leading." All material was mimeographed and a copy furnished to each staff member, who studied it and made his contributions at staff meetings, so that a single comprehensive reply was received. We have lost some sleep since receipt of the report trying to think of a friend with a "cast-off covered wagon" listed as "Upper Grade Apparatus" but someone has already furnished the "cast-off airplane" for the 1st and 2nd grades. We were forced to agree that Elementary Education has really arrived with the listing of "1 grog bin" under "Arts and Crafts Room Equipment." We must also conclude that the staff produced a magnificent document and made an invaluable contribution to the school plan. Constant reference is made to this report during the entire planning process. For reference, some of this material is appended to this article.

As soon as we were sure of our recommendations, we prepared agenda which would conduct the Building Committee through the very logic which had led us to these recommendations. In our opinion, the site is second in importance only to the client. In this case the site is magnificent. It lies on gently sloping land at the mouth of Stone Canyon, adjacent to the University. A stream bed 100 feet wide and nine feet deep traverses the property from north to south. The stream is confined to a small channel, and contains some water throughout the year. Tremendous sycamore trees grow near the stream, large eucalyptus form a border along the highway to the west, and three groves of acacias, peppers, and redwoods cover the east bank of the stream. A high steep bluff separates the site from the campus to the east.

Suit the School to the Site

All of these natural features could be looked upon as difficulties easy to overcome by filling the stream bed and cutting down the trees, thus leaving the architect free to design an "ideal" school suitable for any ordinary site.

But here is presented a major point of theory and question of school policy. Should the natural site be forced to meet the demands of "perfection" in abstract design, or should site "difficulties" be transformed creatively into unusual advantages to the school program and design? In our opinion, the unique characteristics of any site can and should be made an integral part of the design. They can be made to contribute advantages otherwise impossible. Accepting this fundamental premise, we attempted to integrate the site and the space needs into a design solution which would contain and enhance the activities program, and fulfill the objectives of the school.

The school program depends on "projects" which furnish a framework of interest and activity in which the pupil learns facts by using them as tools to achieve results, rather than as ends in themselves. Projects such as the harbor, the community, and early California, Indian, Spanish, pioneer, and mining periods are used as vehicles for learning through doing. Since about fifty per cent of the teaching will be done outdoors, the existing stream bed and trees make an ideal setting for these projects. Agreement on this policy by the Building Committee was the major decision affecting the plan.

Decisions on the functions, form, and program of the school were also prerequisite to finding a solution. These decisions were made as the result of questions raised by the architect at his first meeting with the Building Committee. The agenda for this meeting led the Committee through the logic which dictated the Architect's recommendations. One point at a time was discussed, alternatives were described or illustrated, and a decision reached by the Committee. The sequence of questions was similar to a geometric problem, so that the solution of the plan seemed inevitable and conclusive, even though the possibilities were endless and profusely illustrated. The minutes of this first formal meeting which determined the development plan are appended for reference.

The plan determined at this stage merely established the location of the major elements and the priority of construction. The subsequent work of de-

veloping preliminary drawings through the extensive use of models is another story. As this is written, working drawings are about to be prepared, and construction may be started in the fall of **1948**, barring unforeseen difficulties.

Time Is Short

Completion of the school cannot come too soon. Never has the education of our children been more important than it is to day. The great social issue which really concerns us Americans is the supremacy of democracy over authoritarian government. This issue is confused by reference to economic systems, individual versus collective action, and emotional name calling. Citizens who have been "taught" by repetition, drill, and external discipline not only tolerate authoritarian government, they have a tendency to demand it! Citizens who have learned through firsthand experience are apt to have minds of their own. Neither despotism nor narrow nationalism can survive in their presence. Children who learn through firsthand experience, through doing rather than being told, should strengthen democracy and make "one world" a reality.

The University Elementary School Program will, in our opinion, make an influential contribution toward this ideal. The architect will achieve satisfaction through designing the school to the extent that we implement and enhance the school program of learning through doing.

Teachers' Response to Questionnaire

A. POLICIES

1. *Experimental or demonstration*

a. The school will serve both functions—*experimental and demonstration*. The staff believes that experimentation can go on in conjunction with demonstration and training situations with *good* management.

b. Both functions will be served during summer session. Demonstration of excellent practices for public school teachers should predominate in the summer session. But, there should also be a *few* situations where those educators interested in experimental practices may be introduced to the practices of the *schools of tomorrow*.

2. *Number of grades*

a. The opinion is that we should stop at the Sixth Grade with the space allotted for the school plant. The staff considered the following advantages of continuing the program through the Seventh and Eighth Grades:

(1) Would provide opportunity to experiment with continuity in the field of Social Studies particularly.

(2) Would meet the constant demand on the part of parents for 7th and 8th grades in line with the program provided by the Elementary School Staff.

But, the idea of expanding the school to include children of 12 and 13 years was overruled because of the following factors:

(1) To provide experiences to meet the needs of children of this age would require additional playground space, additional facilities for crafts, and an additional staff of supervisors—all of which must be housed. Children of 12 to 13 require large spaces for team games; industrial arts becomes highly specialized into separate crafts; etc.

(2) It requires a tremendous amount of organization to bring into a harmonious whole, groups of such varying age. It is most difficult to keep the adolescent from dominating the younger children, etc.

b. When the University Elementary School has become an established school, parents will demand situations for children from 12-18 years. Then, these parents will aid in securing facilities which should be on space set aside for children of those ages. Then, controlled experimentation could be carried on to determine the respective merits of the 6-3-3 and the 8-4 plans of organization for children of ages 12-18 years.

c. The staff believes the best general grouping to be that of *chronological age* with adjustment made by the staff to meet needs of children who move more slowly or more rapidly than the average. However, the staff would not insist upon divisions of age groups into A and B classes.

The Nursery School would like to have children of 2 years and 3 years only—leaving the children of 4 years and 5 years to the Kindergarten. This, of course, involves running contrary to the State Law on Admission of Children to Kindergarten and First Grade.

To meet the needs of education in rural California, perhaps one room should be devoted to the demonstration of practices used in a one-room school of 6-8 grades. (This practice has met with great success in Summer Session.) The children could be selected from the "overflow" from the grades and because of the need of a "family" grouping, etc.

Experiments might be carried on with two grades in a room, etc.

The staff discussed the possibility and feasibility of setting up rooms to carry on work of a special nature, such as:

(1) Remedial Reading
(2) Sight-saving
(3) Teaching of the hard-of-hearing
(4) Teaching of the slow learner (I.Q.70-90)

The staff believes that space, equipment, etc. will not be available to handle *successfully* the mentally deficient (I.Q. below 65)

The staff hesitated to recommend services without further discussion as to cost of maintenance.

3. *Observers*

a. Plans should be made for not more than 20-25 observers in Nursery School and Kindergarten.

b. In Nursery School and Kindergarten the observers should be hidden. Installation of one-way vision screens will be necessary. Beginning with the first grade the teachers prefer to have the observers seen. They believe that the teachers will like it better and the children will be less curious. It has not been the experience of those on the staff who have demonstrated and worked with demonstration summer schools for years that children are bothered by observers *when the teaching is effective and challenging*.

c. Observers should be segregated from the class. Only upon the invitation of the teacher or director of research should an observer *ever* mingle with the children.

4. *Specialized classes*

a. The staff has made the following recommendations regarding space for special subjects:

Music (Singing, rhythm bands and creative music)

Should be held in regular classrooms throughout the school. There should be in each room electrical outlets for the phonograph and built-in cabinets for housing musical instruments, records, phonograph, and music books. A piano should be a part of the equipment of every classroom. Practice should be held in the auditorium. Space should be allotted here for housing of instruments, stands, music, etc. A *grand* piano should be in the auditorium.

Rhythmic Expression

In Nursery School and Kindergarten the children carry on rhythmic activities in the regular classrooms *and* on the lawn adjacent to school yard.

This means that plans should be made for housing a piano out-of-doors, or in such a way that an indoor piano might be pushed on to a platform for out-of-door rhythms.

From 1st through 6th grades the teachers believe that most of the rhythms growing out of Social Studies experience can best be carried on in the classrooms—with occasional practice in the development of patterns requiring space in the rhythm room. Too, they would like a *dancing green*. This might be the *floor* of the outside amphitheater—or a walled-in enclosure adjacent to the rhythm room. Naturally, there would need to be provisions made for housing a piano.

Painting

In Nursery School and Kindergarten much painting on easels is done out-of-doors. Out-of-door cabinets are needed to house these easels. Also, these young children paint indoors thus making necessary housing space indoors for painting equipment.

In all other grades the children paint in the classrooms. Easels made of drawing boards and placed on tables can be used. In some school rooms there are revolving blackboards with easels on the back of them. This enables part of the children to stand about the room at the board instead of being crowded together at their tables. This latter arrangement would be nice if feasible and possible. Housing space must be allotted easels, types of drawing paper, paints, brushes. Also, the rooms should be finished to the ceiling with material into which thumb-tacks can be driven in order to show the work of the children.

Industrial Arts

Most of the Industrial Art work is carried on as an integral part of the Social Studies program. Thus, most of it will be done in regular classrooms. This makes necessary in each room a sink, a portable electric stove which can be pushed from a wall closet to a central position in the room, electrical outlets, a space to house lumber, lockers to house children's unfinished work, shelves for other materials, etc. Attention to tool cupboards or cabinets is essential.

Large activities, such as the dyeing of huge quantities of material, using sewing machine, working on a large Jaquard loom, certain types of wood-construction, the drying and firing of pottery and the like, will be carried on in a well-equipped craft room (described later).

Clay Modeling

This will be done in the regular classrooms.

Provisions must be made for housing clay objects while in the process of being created. Also the housing of plaster-of-Paris bats upon which the children work and the wet-clay should be considered.

Dramatic Play

This is an *essential* in Modern Education throughout the elementary grades. This involves room space and yard space—lots of it—for the block-building and play activities of the children. Shelves for blocks should be built in each room through the third grade. Outside cabinets for housing blocks, toys, and play equipment are needed.

In all rooms from 1st through 6th grades at least one wall from floor to ceiling must be covered with material to which a "back-drop" may be fastened. No room should be less than forty feet long. Space for observers should be added to the forty feet. If there is one requirement more essential than any other it is for *space* for play and work activities.

5. *Studies not mentioned before*

a. Home-making activities are included in the Industrial Arts program in the Elementary School. It would be very helpful to have a well set up kitchen in which the children might have experience in cooking for picnics and parties—and doing the baking associated with bread studies and the like. We believe the craft-room could be fitted up so that a kitchen would not be an essential.

b. (1) Experiments in science, chemical, physical and natural, require special apparatus and materials. It would be wonderful to have a small science laboratory where children could be better protected during experiments.

(2) The staff would like a *Nature Enclosure* in which to house livestock, poultry, and animals used in connection with Social Studies, etc. Attention should be given to the needs of each type of animal in order to house each properly.

Too, pens should be built adjacent to the classrooms for housing the "beasts" temporarily.

Space for gardens should be provided with a lath-house adjacent.

Dark curtains should be supplied for every room including the auditorium to meet the growing demand for Visual Aid teaching.

6. *Other buildings*

The staff prefers a *large kitchen* with steam-table service to rooms and outdoor eating places.

If it should be considered advisable to build a cafeteria, then may there be a staff dining room in connection with it?

The school really needs a theater-auditorium where motion pictures and culminating activities in the Social Studies may be shared with the whole school—1st through 6th.

The rhythms room takes the place of the gymnasium, and also serves as a meeting place for student-teacher affairs, and as a place where small groups of parents may confer.

An outdoor theater would be wonderful—with dancing-green in the center.

It would be fine to have a swimming pool, as it is doubtful whether the Physical Education Department could spare either of their pools for the use of the children. Then, the adult pool carries more or less danger of infection.

B. RELATIONSHIP

1. *Elementary School Function to Any University Function*. Example: Women's Physical Education Teaching to Elementary School Playground.

The University Elementary School can have a relationship with any department in the University in sharing equipment, advice, and actually talking to groups of children. Called upon *often* have been the departments of Geography, History, Anthropology, Astronomy, Physics, Mechanical Arts, Home Economics, Agriculture, Natural Science, Music, Nursing, Visual Aids, Physical Education and Psychology.

The University Elementary School would serve as a demonstration and experimental school for all departments in the School of Education—Administration—practice in supervision. Curriculum—practice in curriculum construction.

330's Prof.—demonstration of techniques of teaching
Principles of Education—demonstration of principles in action, etc.
Statistics—participation in testing, scoring, etc.
Parent-Counseling—participation in parent activities under direction of Counselor, etc.

The school will serve as a place to furnish supervised teaching and *supervised supervision* in the Department of Training. Each Demonstration Teacher should have the help of an outstanding student-teacher. Then, the Training-Teachers could handle a quota of four students. As the staff changes, the function of training could become less in importance—but forward-looking educators in California will not like this. They have liked the products of the University Elementary School because of the acquisition of progressive techniques by student-teachers.

To some extent the school will serve as a teaching laboratory for other special departments in the field of

Education—such as Art, Physical Education, Music, Nursing, Home Economics, Visual Education, etc.

2. *Function within Elementary School*
   a. Nursery School and Kindergarten should be an integral part of whole school. (Nursery School should be financed by University.)
   b. They should not be housed in one building. The multiplicity of needs in the varying age-range makes it necessary to have separate buildings. Much strain is eliminated.
   c. Nursery School and Kindergarten *seldom*, if ever, use any of the services of the rest of the school.
   d. Studies in both research and administration can be carried on in Nursery School and Kindergarten.
   e. Covered sections are mandatory in main school building and from main building to administration center. Not so important to connect with Nursery School and Kindergarten but would be *very nice!*

3. *Distance between buildings or function*
   a. Advantages of separate building far outweigh disadvantage of distance between. Strain is almost eliminated by reduction in trying to adjust to the needs of others. However, if it is necessary the age groups could be housed in rooms adjacent—two six-year-old-groups—two seven-year-old groups, etc.
   b. The classroom should be as close as possible with separate units to the administration building.
   c. The playground should be as far away from the classroom as possible—and still conserve play space.

4. *School to street—comment on noise factor.*
   The school should be as far from Sunset Boulevard as possible—just east of the "wash." All demonstration rooms should be provided with soundproofing material.
   a. The main playgrounds should extend from the "wash" west to Sunset. A 12-foot wall should enclose the area—keeping balls and children from street. A plot in front of the wall could be landscaped!
   b. Small playyards for Nursery School, Kindergarten, First and Second grade children will be adjacent to their rooms.

C. TRAFFIC

1. *Access from Sunset Blvd.*
   a. In morning at 8:45 at least half of the children will arrive by private cars. (175) Entrance from Sunset past Administration Building could be provided for children from 1st through 6th grades.
   Children of Nursery School and Kindergarten could enter from Sunset Blvd. at designated places cut in wall.
   b. Cars come from every direction—but discharging of children can be controlled by proper notification and scheduling.

2. *Parking*
   a. Staff supervision and University Police Department can control parking so that area provided for elementary school will not be used by general students.
   b. Normally, thirty cars owned by staff will be parked.
   c. From twenty to three hundred cars will require parking for parents' functions.
   d. University students will park on University campus and walk to the school—although we are just guessing.

3. *How do children travel*
   a. At least one-half of the children come by family car.
   b. There can be a bus owned by the school—but we have used "Harvey" buses with great satisfaction.
   c. At least one-half will come from the old campus. We cannot prophesy about the others, as it is our wish to have a cross-section of American Life in the school—different races, creeds, economic status, etc.
   d. Out of 300 children on the old site, 50 rode bicycles. Need *covered* racks.

4. *Service road*
   a. The University Elementary School will need existing service road for delivering of supplies, etc.
   b. Outside limits should be definitely outlined with a strong fence at the rear and south side and a wall around Sunset!

D. ORIENTATION

1. *Grade school classrooms*
   a. 100 per cent north light not considered ideal by staff. Please, no Venetian blinds!

2. *Nursery and Kindergarten*
   a. Nursery School and Kindergarten like rooms facing onto a south playground.
   b. Two-year playroom used in p.m. for sleeping room for older children, play groups, and conferences with parents.

3. *Administration, research and special rooms*
   Principal's office off reception room with door to staff room where meetings of 20-40 persons may be held.
   Assistant Principal's office connecting with Principal's office.
   Counselor's office near Principal's office and connected with office of Research Director.
   Nurse's office near counselor's office and near reception office.
   Offices of special supervisors as near as possible to main building—with Physical Education supervisor near to playgrounds of older groups. Corrective room should be connected with this office.
   Faculty restroom and lunchroom should be in Administration Building.
   Student-teacher workroom, restroom with adjacent lunchroom should be in main building.

E. PLAYGROUNDS

1. *Area required or desired*
   Minimum recommendation of 75 sq. ft. per child. Nursery School and Kindergarten demand 200 sq. ft. Needs vary with activities carried on. Miss Anderson lists the following minimum space requirements:
   2 Speedball fields 100 x 60 } same
   4 Diamonds 90 x 90 } space
   1 Basketball court 60′ x 36′
   2 Volleyball courts } 25′ x 15′
   2 Handball 15′ x 30′ } side by side
   4 Tether-ball poles 15′ radius
   4 Circles 25′ diameter
   Outside cabinets needed for equipment.
   Playgrounds need to be surfaced with *Blacktop* (American Bitumuls Co., 200 Bush Street, San Francisco, Calif.).
   Lines for games should be painted with *traffic paint* as follows:
   4—45′ diamonds
   2—30′ diamonds
   1—25′ x 50′ volleyball court (2 posts)
   1—90′ x 45′ basketball court (2 baskets)
   4—designs for hop-scotch games
   4—16′ x 16′ square areas.

2. *Games played*
   The largest area is needed for speed-balls—a space 100′ x 60′.

3. *Equipment and playgrounds*
   Nursery School list will be handed in by Dr. Christianson.
   Kindergarten: (For one group of 25-30 children)
   8 packing boxes—of various sizes
   4 swings
   1 parallel bar
   1 jungle gym
   1 walking board (a 2″ x 4″ x 12′ board raised 4″, 6″ or 8″ from ground)
   1 slide
   1 climbing ladder—stationary
   6 portable ladders
   2 water tables 2′ x 6′ x 2′ high
   1 sand pile 6′ x 10′ or 8′ x 12′
   4 pet pens (for ducks, rabbits, mice, etc.)
   2 carpenter benches

6 saw horses
6 hammers
2 saws
6 vises
2 screw drivers
Wood—2 supply of soft pine wood for children's carpentry
1 clay storage box or metal lined container
8 easels
Equipment for sand and water play—e.g., watering cans, sieves, cookie cutters, sand moulds, pans and baking vessels
Sand toys—such as ditch diggers, trucks, cement mixers, steam rollers, etc., etc. (these are miniature)

First and Second Grade Apparatus:

Horizontal bars—sand pits
Turning bars with sand pits
Traveling rings
Swings
Teeters
Jungle gyms (combined with swings and traveling rings)
Large packing boxes
A cast-off airplane!
A cast-off delivery truck!

Upper Grade Apparatus:

Giant Stride with sand pit
Horizontal bar—sand pit
Swing unit
Traveling rings
Set of teeters
Packing boxes
Old carreta
Cast-off carriage
Cast-off covered wagon

Equipment consists of soft balls for 1st and 2nd grades, hard balls, baseballs, soccer balls, footballs, basketballs, bats, nets, ball-markers, hard-markers, etc.

4. *Separation Policy*
   a. There is little segregation of sexes in the University Elementary School.
   b. Sometimes boys and girls are segregated for certain games in 5th and 6th grades.
   c. Separate areas are required for 2 yr. olds, 3 yr. olds, 4 yr. olds, 5 yr. olds, 6 yr. olds and 7 yr. olds—adjacent to their classrooms. Third, fourth, fifth and sixth grades use same yard space—but there are many sections of it so that activities may be varied to meet the ability needs of the children.
   d. First grade children use a sand-box, but change rapidly to the packing-box stage—large airplane stage. They use swings, teeters and jungle gyms.
   e. Fourth, fifth and sixth grade children play softball and basketball. Both sexes play sometimes together, sometimes just boys or just girls.
   f. Our girls are quite *physical*. They seldom, if ever, play circle games after second and third grades. They engage in baseball, tether-ball—most everything but too fast games of speedball and soccer. They *might* play these if the boys didn't complain about their woeful lack of skill. We have very few "bench-sitters."

5. *Location*

   As stated before, the staff believes that the playgrounds should be located as follows:
   (1) Playgrounds for *older* children should be located between Administration Building, Sunset Blvd., and the road leading to campus—as far as possible from classrooms.
   (2) Playgrounds for nursery school, kindergarten, first and second grades should be adjacent to their classrooms.
   (3) Physical education office in Administration Building should have a southeast outlook over playground for older children.

6. *Fences*

   As stated before, there should be a 10′-12′ wall built on Sunset Blvd. with landscaping in front of it. Wire fencing should be used to outline the rest of the school. Gates with locks should mark entrances. This protects the children and their outdoor projects.
   If the wall is built, the separate areas within the school in nursery school, kindergarten, first and second grades can be indicated with hedge instead of wire.

7. *Time of use*
   a. In nursery school and kindergarten playgrounds are used nearly all day.
   b. Grade playgrounds are used much of the time—but physical education as a *subject* is scheduled in the afternoon.
   c. Yes, there is always a schedule. Even with several play centers it is desirable to work to a schedule.

8. *Use of natural features*
   a. The staff believes that the site offers outstanding opportunities to extend and deepen the experiences of the children in natural and physical science—in geography and in art appreciation. With proper supervision no danger can come to the children through the use of the natural facilities of the site.
   b. The natural stream will be a source of educational interest to children of all ages—the home of pollywogs and frogs and water to play in for the younger children—a river leading to Los Angeles Harbor for the eights and nines—a source of water supply for pioneer settlements and a place to mine gold for the tens—and an opportunity for the study of waterpower for the tens and elevens!

      Yes, there may be some wet feet occasionally, and it will require some degree of supervision—but, the educational values far outweigh these minor difficulties.

      Too, because of the greater use by the *older* children of the stream the staff believes that the older children should be housed in the *north* wing of the building: (6-5-4 and 1-2-3). The third grades build boats and use them in an outdoor replica of San Pedro Harbor. Thus they can well be at the south extreme where the stream becomes dry more quickly and the "wash" widens out. Too, the third grade can use the playground to the south, as more space is needed than for the 1st and 2nd grades.
   c. With master teachers control can be handled—supervision and *fencing* if needed.
   d. Some thickets will necessarily have to be sacrificed, but others can be fenced and saved for exploration areas.
      Because of these thickets the general public must be kept out with walls and fences.

9. *Project areas*
   a. Outdoor projects and housing needed:
      (1) Dr. Christianson will hand her suggestions in separately for *Nursery School.*
      (2) *Kindergarten*

Outdoor Projects:

Gardening—digging and hauling
Pets—care of
Carpentry
Block Building—with large hollow blocks
Dramatic play including:
- Home and Housekeeping
- Automobile, filling station
- Keeping store
- Train, boat, airplane
- Farm, dairy

Painting on easels
Modeling with clay
Rhythmic activities to music—dancing
Experimenting with musical instruments
Sand and water play

Toy-storage outdoors:

Out-of-door sheds for storage are indispensable for Kindergarten, as practically all activities—excepting rest—are carried on out-of-doors in good weather.

Equipment and toys stored out-of-doors include:

4 tricycles
2 wagons

2 large "horses" (rocking horses without rockers)
6 portable ladders
Hollow yard blocks—24 blocks 6" x 12" x 24"
24 " 6" x 12" x 12"
24 " 6" x 6" x 6"

Out-of-door doll house furniture (child-sized not doll-sized)

1 table	1 stove
4 chairs	1 kitchen cabinet
1 rocking chair	1 baby carriage
1 dresser	1 cradle
1 doll bed	

Accessories to outdoor dramatic play:
A list of properties accessory to children's play is appended:
Home and Family:
Permanent Equipment (large or in miniature):

1 doll bed	1 rocking chair
1 dresser	1 stove
1 dining table	1 kitchen cabinet
4 dining chairs	

Accessory Equipment:
Washing:
wash tub
wash board
ironing board
iron, cord and plug
laundry bag or soiled clothes hamper
laundry basket
clothes line and clothes pins

Cooking:
1 set cooking utensils (frying pan, double boiler, saucepan, spoons, waffle iron)
dish pan
dish towels
1 set dishes
1 set silverware
tablecloth and napkins
empty food cans and cartons

House-cleaning:
1 dust pan
1 broom
scrub or dust mop

Care of baby:
baby doll and clothes
rubber baby doll
cradle and bedding
dresser for baby clothes
bathinet or tub
soap
powder
soft towels for drying baby
high chair
bib
baby bottle
baby carriage

Social life—intellectual, business life of family:
telephone and telephone book
scratch pad for orders and notes
radio
piano
magazines
newspaper
mail box (occasional play)

Travel and moving:
suitcases
trunk
fabrics for dress-up-colored lengths:
1 yd. square
1 yd. cut into 2 triangles for scarf
1 yd. length by ¼th for girdle
1 yd. length by ½ yd. for head band
signs: for sale; for rent

Workers who come to the house:
milk cartons or wooden bottles for milkman
electric wire and plugs for electrician
telephone and telephone wire for painters
wagon for workers such as electrician
painter, telephone repair man
grocery delivery boy—truck, empty food cartons
metal tool box for workers (Sears-Roebuck)

Dairy Play:
cows (large or in miniature)
bull
baby calf
horses
hay cart or wagon—hay (oats or grain)
wooden ramps on which animals may be pulled up or down
blocks or boxes for sheds and barns
fences and enclosures
rope or string for pulling animals about
"hose" for hosing down animals and for washing out stalls

Bakery:
shelves—oven—counters
tables for working
cookie cutters—pie pans—cookie pans—cookie sheets
mixing bowls
pitchers for liquid (if mud pie bakery)
calcimine frosting for dried cakes
powdered clay for sugar coating
pasteboard boxes for pies—cakes (from Van DeKamps)
cash register
scales
telephone—pad for orders
oil cloth aprons for bakers
bakery truck

Filling Station:
tricycles (for automobiles)
gas trucks (wagon-keg for gas tank)
gas tanks (blocks or boxes)
gas hose (from dime store)
hoist
tire pump
jack
oil cans (movable noses)
flash light
cash register
sponges, rags, chamois for cleaning
tools—hammer, screw-driver, pliers

Grocery Store:
Enclosure containing counter and shelves
Empty cans and food boxes, sacks
Sand (for sugar, salt, flour)
Scoops, cash register, telephone
Pad for orders
Paper bags
Sign: open—closed

Airplanes:
Large—
block or packing box plane
safety belts (fishing-pole belts at Sears-Roebuck)
aluminum tray and cups
plastic plates with food compartments (for hostess play)
radio earphones (made from typewriter spools and wire)
portable steps for passengers

baggage
scales to weigh baggage
mail bags and mail
mail cart (wagon)
paper tickets
paper clipped to cookie sheet for dispatcher's checking list

Miniature—
small planes for flying
larger ones for mechanic play on floor
block or box hangars
tractor to haul planes out of hangar
tools for overhauling
mail

Boats:

Large—
banana box for fishing boat
rope to pull boats around
steering wheels for boats
fishing poles (dowel with type ribbon spools for reels)
oil cloth fish
lunch box for fisherman
6 enamel pans for fish at market
boats—passenger and freighter (built of large blocks or boxes)
painting outfit for repainting boats
binoculars for lookout
loud-speaker for storm warnings

Miniature—
floor block pier and docks, breakwater
freighter
passenger boat
fishing boats—tugs—ferry boats
lighthouse—bell buoys
painting and repair outfit for overhauling boats
small cardboard fish and small dowel fishing poles
oil cloth fish
hoist
crates to pack fish

Trains:

Large—
water table and large barrel for engine
water table for coal car
box and shovel to fill sand dome
boxes for freight
hand truck to load freight
bell

Miniature—
Seever-toy train and cars
matched boards for tracks
turntable and block or box roundhouse
tool box for repairing and painting trains
water tank
oil depot or coal chute
sand filler
colored beads or rocks for freight

(3) *First and Second Grades:*

Gardening—requires a plot.
Study of pets—requires pet pens that can be locked.
Building of communities—requires a large space of ground—at least 20′ x 30′.
Experimenting with *old* airplanes, trucks, etc.

(4) *Third Grade:*

Gardening—experimenting with products grown in California and transported to other countries. Requires a plot.
Building of a large replica of San Pedro Harbor with facilities. Could have Los Angeles River (the wash) if situated at south end of building site.
Building a large Indian Pueblo of packing boxes—preferably on hill top! Might make a *mesa* of a hill!

(5) *Fourth Grade:*

Gardening—experimenting with products grown by peoples being studied.
Building outdoor *Casa Adobe* of Early Californians—with patio, outdoor oven, etc.
Building a mining camp on the American or Yuba River (the stream in the wash).
Constructing outdoor map of California.

(5) *Fifth Grade:*

Building a Colonial Cabin (logs—surfaced 4 sides) of the early Plymouth type—near trees.
Building a pioneer cabin (real log-cabin) for studies of Westward Movement.
Constructing permanent outdoor map of United States over which covered wagons can make trip west. (Can be outlined on playground.) Also, this map is used in studies of Industrial America. Actual planting of grains, etc., can be done if large enough.

(7) *Sixth Grade:*

Building of outdoor airport. Hillside for launching gliders.
Level spot for launching of hot air balloons.

F. EATING

1. *Children*

a. Cannot determine the food and milk needed until the number of children is decided. We cannot accommodate over 300 children adequately.
b. Many children bring lunches or a part of a lunch so there should be lunch space with benches and tables *under* cover. The site offers a *continual* opportunity to make a picnic of everyday lunching.

2. *Teachers*

a. There should be a lunchroom adjacent to teachers' restroom in the Administration Building. It offers opportunity for a social and professional exchange of experiences especially desirable for the newer members of the staff.
b. Many of them bring lunches as they have no time to leave the grounds. The staff is counting on "steam-table" service.
c. University cafeteria is impossible for demonstration teachers.
d. If a cafeteria is built, there should be a faculty dining space.

3. *Student teachers*

There should be a lunchroom for student-teachers adjacent to the student-teacher workroom and restroom in the *main* building (not in Admin. Bldg.).

4. *Social or observation functions*

For small groups—teas in Rhythms Room. This necessitates a wall cabinet with hot plate, dishes, etc.
Some provision is necessary for serving refreshments to large groups of educators and parents at rear of auditorium. Main kitchen could be in close proximity to the auditorium.

5. *Employees*

Secretaries, clerks, nurses, etc., share the facilities of the academic staff.
Custodians and gardeners should have comfortable quarters for eating and rest—as well as for clay, brooms, etc.

G. NURSERY SCHOOL

1. *Separate sleeping rooms:*

Separate rooms are required for the children who stay until three o'clock.

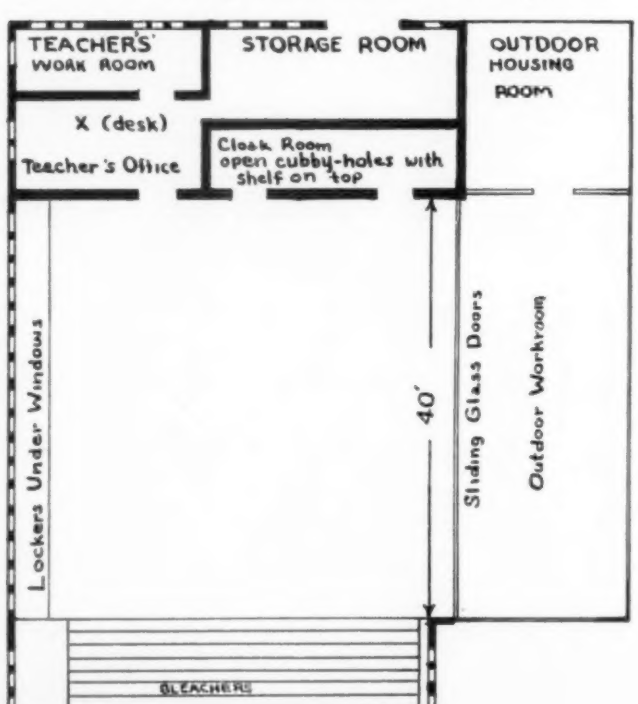
2. *Division in toilet:*

The sliding partition in the bathroom is to guard against strain. It separates the younger children from the older ones and in no way separates sexes. It is necessary as the younger children require more toileting than the older ones.

3. *Eating:*
   a. Children eat in playroom so no permanent dining room is desirable.
   b. Space for 2 year old dining is not necessary.
4. *Toilets:*
   There should be two adult toilets for teachers and parents.
5. *Location of isolation room:*
   The suggested plan to have the office next to entrance, isolation next to office and toilet next to isolation room, with no connection to kitchen, is entirely satisfactory.
6. *Toy storage:*
   The answer to this question will be included in Dr. Christianson's material to be handed in later.
7. *Teachers' workrooms:*
   This is needed!

H. KINDERGARTEN
1. *Kitchen:*
   Some preparation of food is often necessary. A kitchenette would satisfy the need. It is a grand, cooperative idea to combine functions of kindergarten and nursery school—*but it does not work.* Let each be a law unto itself alone.
2. *Adult toilets:*
   At least one adult toilet is required. There is much parent participation.
3. *Relaxation and parents' conference room:*
   Program calls for a large space. Explain its importance and use.
   Such a room is needed as children's sleeping room, for rhythms, and for parents' meetings. From 25-30 cots must be placed on the floor at once.

I. GRADE SCHOOL
1. *Observation:*
   a. Provision should be made for observation by 50 people. Like the "tiered" idea at rear of room. Children could use it for evaluation and discussion periods when not used by observers.
   b. Students will take many notes.
   c. They will not need side arms.
   Note: These observation "bleachers" should not be included in the 40' of length of the rooms.
   Training Rooms and rooms for experimental purposes should not include observation "bleachers."



2. *Offices and workrooms:*
   The teachers from 1st through 6th grades indicated the answer to this question by drawing a rough diagram of what they believe they would like.
3. *Storage space:*
   See plan in (2).
4. *Cloak rooms:*
   See plan in (2).
   Dual use of room or space will not do.
5. *Outside project areas:*
   See plan in (2).
6. *Outlook:*
   Each one should look out on outside work-area, to a small court and on to project areas.
   Nursery school, kindergarten, first and second all prefer adjacent playgrounds.
   The noise from the upper grade playground is distracting.
7. *Shape of rooms:*
   For the type of activities we carry on, the oblong room is most desirable and workable. Too, for demonstration it is better.
   The staff as a whole prefers the oblong type for all grades.

J. ADMINISTRATION
1. *Receiving of supplies:*
   a. Supplies should be delivered at the rear of the general store room in the Administration Building through a *wide* door. A loading platform might be built to facilitate this service.
   b. Platform should be on the service road for trucks which should run to the rear of the Administration Building.
   c. Receiving of supplies is controlled by the clerk of the school with the aid of the custodian.
2. *Public toilets:*
   The toilet facilities in the Administration Building may be used by persons visiting the school if they secure the key from the clerk.
   Adult toilets in the lavatories of the main buildings may be used by the public (*school* public).
3. *Lost and found:*
   a. Provision should be made for storage of lost and found articles.
   b. A cabinet should be built in the reception room for money, car-books, hair-ribbons, rings, small toys and the like. A locker room in connection with the general storage office containing a pole for lost sweaters, coats, etc.—and space for large toys, bicycles, etc., could house the larger articles.
4. *Janitors and gardeners:*
   Facilities should be provided in the workrooms of gardeners and custodians for the supplies and tools appropriate for each line of work. Toilets, and combined lunch and restrooms should be considered for each set of helpers.
5. *Heat:*
   The staff believes the University is heated with steam but has no idea how it can be piped to the school.
6. *Cultural projects:*
   The question of provision for such projects as live pets and gardening answered previously.
7. *Physical education office:*
   Location of the physical education office was discussed previously.
8. *Music supervisor's office:*
   The Music Supervisor has an office in the Administration Building. The *rhythms accompanist* should have an office in the rhythms room and adequate storage room for instruments used in percussion accompaniment.

K. SPECIAL ROOMS
1. *Location:*
   As nearly as possible these rooms should be of easy access to all grade rooms. Library, museum, and science laboratory will be used more by upper grade groups.

2. *Arts and crafts room:*
   a. Available to all grade rooms.
   b. Rather noisy, but no more so than other classrooms during construction periods. Might be made soundproof.
   c. Not necessary to include outdoor space.
   d. and e. Should include large well-lighted storage space for racks of lumber—perhaps a space 12′ long—cupboards for extra tools, nails, paint, etc.
   A kiln room about 12′ square with drying cabinet and shelves for work ready for firing.
   In main room there should be low lockers for children's work.
   Tool cabinets and small lumber rack—perhaps moveable—easily available to children.
   3 zinc-lined clay bins.
   1 plaster bin.
   1 grog bin.
   1 wedging table.
   Zinc-lined damp closets.
   Two sinks on two opposite sides of room.
   Four electric plates (powerful), each on a low table which can be rolled out in open space and plugged in an outlet in floor. Top of plate to be flush with top of table. (This is to be arranged so that children can gather around in groups for dyeing, etc. A stove against the wall is of little value for group work.)
   Convenient electric outlets in floor.
   Space for 12 work benches, work-tables, two sewing machines, large paper cutter, electric ironer and washing machine. Open space for setting up sawhorses.
3. *Rhythms room:*
   This should function only as a rhythms room, a room for small group parties for children, a place for small parent-meetings, and a place for faculty and parent groups to serve tea. It should not be used as a Little Theatre.
4. *Library:*
   Used by children as reading room. It should be large enough to allow a class to study library-techniques together.
5. *Museum:*
   a. The museum should house regalia used in *Social Studies* projects and other school activities—such as exhibits of rubber, oil, silk processes, tire-building processes, branding irons, colonial dishes, authentic clothing from other countries, dolls dressed to illustrate clothing of foreign peoples, etc.; nature study collections; photographs, charts, illustrative picture materials, maps, music, records, films, slides, etc.
   b. The museum should adjoin the library and contain shelving, clothes racks, etc., appropriate for the articles to be housed.

I. GENERAL

1. *Materials:*
   a. No blackboards are needed in Nursery School and Kindergarten. Fifteen feet is ample in First Grade. In all other grades there should be a combination, revolving blackboard-drawing board. In that way there could be blackboards available on several sides of room when needed.
   b. All wall space should be suitable for tacking up exhibits—from floor to ceiling.
   c. Unless something better is found which is good for children and teachers to live upon—battleship linoleum would be satisfactory for the floors.
   Nursery School and Kindergarten floors should be warmed if possible in winter.
   Floors should be easily cleaned.
   Rhythms room floor and possibly auditorium floor should be of hardwood.
2. *Lighting:*
   Rooms should have adequate natural lighting. But, with the proximity to the beach, artificial lighting is needed much of the time. Need a scheme which will give adequate light in *all* parts of each room.
3. *Ceiling heights:*
   Must be high enough to provide enough air space per child.

"To The University Elementary School Staff:

The elementary school building committee and the executive architect solicit your help and your suggestions in planning the plant. In order to be of assistance to you as you study the problems of the project we are giving you the report of May 1946 of the building committee. This is a starting point, but it should be considered neither frozen nor final; it should be improved.

"Lloyd N. Morrisett
Chairman, The University
Elementary School Building
Committee"

Functions and Objectives of the University Elementary School

"The first and most obvious function of the University Elementary School is that of serving as a laboratory school in connection with the School of Education, and as such present a realistic objectification of the principles, practices and materials with which teacher education is concerned.

"The most obvious and the primary function of the laboratory school is to furnish an example of the activities with which teacher education is concerned. This is commonly known as the demonstration function. Its purpose is most fully achieved when it is possible for prospective teachers to see in actual operation the procedures essential to effective learning and teaching.

"The second function which a laboratory school should serve is that of providing facilities for the actual practice of teaching by students. It is highly desirable that in a laboratory school, conditions resemble as closely as practicable those actually to be met in the public schools in which the young teacher is later to serve. The advantage which a laboratory school possesses for this function is the authority for controlling and modifying the conditions of class size, curriculum, schedules, and similar elements, with the view to making the situation as appropriate as possible for fulfilling its functions as a place for student teaching.

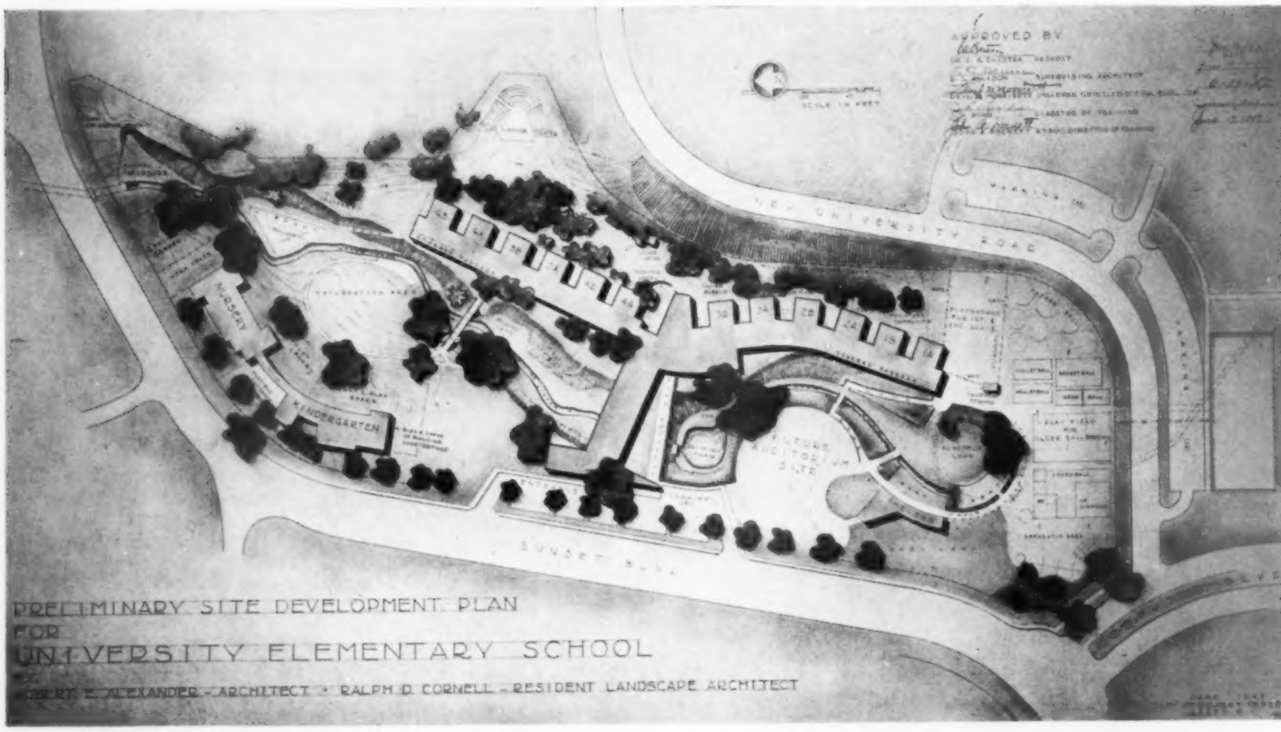
"The third function of a laboratory school is that of providing opportunities for experimental work in education. The materials of instruction, classroom procedures, and the relative advantages of certain variations in schedule and periods of application are all matters which are subject to change and improvement, in the light of more accurate and complete knowledge. By experimentation is meant an objective evaluation of various forms of curriculum and methods. The school of education in a university should advance the theory and science of education. In order that experimentation may be carried on, the curriculum and methods must be varied according to deliberate plan and under controlled conditions. Methods of evaluation must also be set up.

"The university elementary school, in order to be a good laboratory school, must also be a good school for boys and girls. It must demonstrate masterful teaching, the best known curriculum practices, and provide at their best all of the services which elementary education and the elementary school minister unto children.

"Apart from opportunity to demonstrate the value of any type of educational program to educators in general, there is a very important responsibility on the part of a laboratory school which is used for observation purposes by students preliminary to their first teaching, to provide a pattern and example of the kind of classroom relationships and activities which may be regarded as desirable. In short, their observation periods should give them familiarity with the most effective teaching and the best classroom conditions and the best classroom experiences for children that can be reasonably provided.

"A laboratory school should serve the department of education. In this it should provide opportunities for research, study, and practice in the several fields of study carried on by the department of education. Among these fields are the organization and administration of elementary education, childhood procedures and practices, mental hygiene, health and physical education, childhood growth and development, tests and measurement, guidance and counseling.

"The objectives of the university elementary school are to achieve the purposes and to realize the functions of a laboratory school in the university in the areas of nursery school



education, and elementary education including the kindergarten and grades one to six."

Miss Corinne A. Seeds, Principal of the School, prepared the following description of activities:

"CURRICULAR EXPERIENCES

IN THE UNIVERSITY ELEMENTARY SCHOOL

A. For the Elementary School Children

"The School of Education at U.C.L.A. is interested in providing learning experiences for its students in education in the University Elementary School. Its first major concern, therefore, is to establish an Elementary School in which the underlying philosophy and practices are basic to the education of citizens in a democratic society. All of the experiences provided for the children in the school from two years through eleven years should, at each maturity level, build the outlooks, insights, attitudes, appreciations and means of control which will render them increasingly more effective members of a democratic world.

"The experiences which follow are basic to such a goal:

"I. *Experiences in the Democratic Way of Life*

All of the children of appropriate age meeting together to discuss problems concerning the welfare of the whole school.

Age groups meeting together in classrooms to share experiences, solve common problems, discuss purposes and evaluate work.

Children in age groups working individually and in small groups to satisfy purposes of whole group. At the same time they engage in experiences in sharing time, space, tools, and materials.

"II. *Experiences through which the children participate increasingly and with more understanding in the responses which men make to their environment to satisfy basic human needs*—(Social Studies Experiences)

"Satisfying curiosity through:

reading to widen horizons and deepen understandings

investigating ways and means of meeting basic human needs; i.e., finding out how the food is secured for a city, how oil becomes gasoline, how fibers become fabrics

experimenting with varied media to find answers to questions and problems; i.e., how seeds grow under different conditions, what makes an airplane fly

"Constructing and manipulating

"Gaining competency in essential skills

"Expressing thoughts and feelings meaningfully, accurately and aesthetically

"Enjoying and interpreting artistic, literary, and musical contributions associated with the studies under consideration

"Engaging in dramatic play.

"III. *Experiences in Gaining Competency with the Tools of Learning*

Reading
Penmanship
Oral and written composition
Spelling
Arithmetic

"IV. *Experiences in the Aesthetics*

Building appreciation of the contributions of artists in the fields of painting, ceramics, architecture, literature, music, and the dance.

Creating in the fields of painting with experience in murals, pictorial maps and posters; of modeling, sculpture and carving; of weaving and textile decoration; of book-binding and block-printing; of singing, playing in the orchestra, and dancing; and composing songs, musical composition, prose, poetry and rhythms.

"V. *Experiences in Health and Physical Education*

Being inspected by nurse.

Engaging in physical activities such as running, climbing, walking and clinging, including such organized games as circle and running games, hockey, baseball, tether ball, kick ball, and basketball.

Resting
Feeding
Toileting.

"B. For Student-Teachers and Participating Students

Teaching

Preparing materials with which to teach

Compiling and writing reading material for the Social Studies experiences of the children

Selecting, cutting and mounting appropriate illustrations

Selecting illustrative materials
Previewing films for use with children
Projecting and tracing wall maps
Experimenting in fine arts, music, industrial arts, science and the like
Resting—relaxing
Meeting supervisors and training teachers in group conferences
Consulting supervisors and training teachers privately.

"C. FOR STUDENTS OBSERVING FOR EDUCATION CLASSES
Observing and recording intelligently behavior of children under teacher-guidance during all activities of the day.
Discussing with teacher her procedures, etc.
Making individual case studies—using records of doctor, nurse, teachers and counselor.
Watching demonstrations of child-study techniques such as interviews and testing.

"D. FOR EXPERIMENTAL WORKERS AND GRADUATE STUDENTS
Observation of special cases.
Research activities.
Scientific study of learning through photographic and other technical facilities.
Special diagnosis.

"E. STAFF ACTIVITIES
Administrative Unit
Principal
Assistant Principal
Director of Research
Clerk and Secretaries
Nurse
Counselor with Assistant
Supervisor of Health and Physical Education
Supervisor of Music
Supervisor of Fine and Industrial Arts
Librarian and Assistant
Museum and Film Librarian
Supervising and Demonstration Teachers
Nursery School Director and two training teachers
Kindergarten Director with Assistant
Teacher and Assistant each for grades 1-6, total 12 persons
Custodians (3).

The report of the Building Program Committee was appended as follows:

"SPACE NEEDS OF THE UNIVERSITY ELEMENTARY SCHOOL"

Number of Rooms	Function	Number Served	Dimensions	Area
1. NURSERY SCHOOL UNIT				
1	Playroom for two-year group. (toilets adjacent)	20	16 x 36	576
1	Playroom for three-year-olds. (bathroom adjacent for three- and four-year-olds divided by a 4′ screen)	12	30 x 22	660
1	Playroom for four-year-olds and dining room for three- and four-year-olds	15	36 x 22	792
1	Sleep-room and quiet-activities room for four-year-olds.	15	16 x 36	576
1	Parents' room and library...	—	12 x 20	240
1	Main Office..........	—	10 x 16	160
1	Research Office..........	—	10 x 22	120
1	Isolation room.......... (next kitchen)	—	9 x 12	108
1	Kitchen..........	—	12 x 14	168
1	Food storage room..........	—	8 x 10	80
1	Laundry..........	—	6 x 10	60
	Auxiliary space to be added for:			
	Toilets for children..........			
	Cloak rooms..........			
	Storage for toys and equipment..........			
	Janitorial closets..........			
	Total..........	47	—	3540
2. KINDERGARTEN UNIT				
1	Classroom for demonstration group..........	25 children & observers	30 x 40	1200
1	Classroom for experimental group..........	25	25 x 40	1000
1	Relaxation room and parent conference room..........	—	27 x 38	1026
1	Parent reception room and library..........	—	12 x 16	192
1	Kindergarten Office..........	—	12 x 13	156
	Auxiliary space to be added for:			
	Toilets for children..........			
	Adequate cloakrooms..........			
	Storage space for..........			
	Office supplies, classroom equipment..........			
	Outdoor toy shed, with outside accessibility..........			
	Total..........	50	—	3574
3. GRADE SCHOOL UNITS (6 units, grades 1–6)				
2 each	Classrooms..........	25 each & observers	30 x 45	2700
1	each Teachers workroom....	—	15 x 18	270
2	each Teachers offices..........	—	10 x 10	200
	Auxiliary space to be added for:			
	Toilets in alternate units for 50 boys and 50 girls..........			
	Adequate cloakrooms..........			
	Storage for classroom equipment..........			
	Terrace area 15 x 30 adjacent to each classroom for outside teaching..........			
	Total for each unit...	50	—	3170
	Total for six units....	300	—	19,020
4. ADMINISTRATION AND SUPERVISORY UNIT				
1	Principal's office..........	—	10 x 16	160
1	Assistant Principal office....	—	10 x 12	120
1	Conference room..........	—	20 x 30	600
1	Office of Director of Research	—	10 x 12	120
1	Counselor's office..........	—	16 x 16	256
	with individual testing room adjacent..........	—	8 x 10	80
1	Office of Supervisor of Health and Physical Education...	—	10 x 12	120
1	Office of Supervisor of Music.	—	10 x 12	120
1	Office of Supervisor of Art...	—	15 x 16	240
1	Nurse's office..........	—	10 x 12	120
1	Supervisor's Supply Equipment and Storage room...	—	12 x 16	192
1	Reception room and general office..........	—	16 x 20	320
1	Records room.......... (adjacent Counselor's office)	—	16 x 16	256
1	Receiving and supply room	—	12 x 16	192
	with mimeographing room adjacent..........	—	10 x 12	120
1	Faculty Women's lounge.... (including kitchenette, (?) cot room, 3 toilets and 2 wash bowls)	—	16 x 20	320
1	Faculty men's lounge.......... (including 2 toilets, 1 urinal and 1 wash bowl)	—	12 x 16	192
1	Women students' lounge.... (including 2 toilets and 1 wash bowl)..........			
	Total..........	—	—	3720

Number of Rooms	Function	Number Served	Dimensions	Area
5. SPECIAL ROOMS				
1	Corrective physical education room (adjacent P.E. and Health office)	—	16 x 24	384
1	Children's relaxation room (adjacent nurse's office)	—	16 x 16	256
1	Detention room (adjacent nurse's office)	—	8 x 16	128
1	Rhythms and community room	—	35 x 56	2016
	(exclusive of storage for audio-visual, kitchenette and dish storage for parent teas)	—	20 x 35	700
1	Library unit, including library, student teachers' work room	—	12 x 18	216
	Librarian's office and work room	—	10 x 12	120
	Stock room	—	10 x 12	120
1	Museum and science laboratory	—	16 x 30	480
1	Arts and Crafts room (adjacent art office)	—	24 x 40	960
	Total	—	—	5380
6. SPECIAL FACULTY RESEARCH FACILITIES				
1	Child study observation room (adjacent counselor's office)	—	16 x 16	256
1	Photographic laboratory (adjacent rhythms community room)	—	12 x 16	192
1	Research unit including general room and 4 conference	—	16 x 24	384
	cubicles	—	6 x 8	192
Auxiliary space to be added for storage of materials in research unit				
	Total	—	—	1024
7. AREA SUMMARY				
	Nursery School unit		3540 sq. ft.	
	Kindergarten unit		3574	
	6 grade school units		19,020	
	Administrative and supervisory unit		3720	
	Special rooms		5380	
	Faculty research facilities		1024	
	Total		36,258 sq. ft.	

COMMITTEE ON THE ELEMENTARY SCHOOL
UNIVERSITY OF CALIFORNIA AT LOS ANGELES

Time: Wednesday, December 11, 1946, 10 a.m.
Friday, December 13, 1946, 11 a.m.
Place: E.B. 143
Present: L. N. Morrisett, Chairman
May V. Seagoe, Member
Corinne Seeds, Member
Harry Hoijer, Member
D. C. Allison, Supervising Architect
C. C. McElvy, Coordinating Architect
R. E. Alexander, Executive Architect
R. R. Pierce, Job Captain
Absent: Katharine L. McLaughlin, Member

A. WORK ACCOMPLISHED

The chairman gave a brief review of the Survey Report Program and Space Requirements Report by this Committee, and the Answer to the Executive Architect's Questionnaire.

B. POLICIES

1. Function: Should school be designed to function as Teacher Training or Demonstration and Experimental School or both? If both, to what extent?

DECISION:

There is no change in the policy that the school must serve all three functions in the following order of importance.
1. Demonstration
2. Teachers' Training
3. Experimental

Teachers' Training will probably be de-emphasized. Every function of the school will be subject to demonstration.

Provision will probably have to be made for observers in every classroom.

2. Form: Should plant duplicate the norm, exemplify the best, or demonstrate experiments?

DECISION:

The plant should exemplify the best.

Experiments in physical plant facilities can probably be demonstrated in the construction of the school.

3. Program: Should master plan for future development include elements not included in existing program? (Auditorium, Open-air Theatre, Large Kitchen, other.)

DECISION:

Master plan should include an Auditorium, an Open-Air Theatre, a Large Kitchen serving into an outdoor area, with modest provision for indoor dining in rainy weather, the Staff Dining Room, Pet Enclosures and space for Custodians. Otherwise the program and space requirements report previously submitted by the Committee is sufficient.

C. MASTER PLAN

1. The Executive Architect stated the need for arriving at approval of a Master Plan at an early date in order to locate temporary buildings and intelligently plan a part of the permanent school.

2. Site:

a. Should natural features (stream bed, trees, etc.) be changed as much or as little as possible?

DECISION:

The natural features of the site should be changed as little as possible, since these features are ideally suited to the School's Educational Program. It is apparent that the cost of installing a storm drain and filling the stream bed will not reduce the cost of construction sufficiently to pay for itself, and would destroy features which can be used ideally in instruction.

b. What are the boundaries of site, and how shall boundaries be treated?

DECISION:

The site is understood to be bounded by the new road, north the Women's Gym, by Sunset Blvd. and the bank, including the fill for the new road to the east. A solid wall along Sunset Blvd. recommended by the Teaching Staff is not considered necessary.

3. Location of Major Elements:

a. Classroom

DECISION:

The classrooms should be located on the east side of the stream bed.

b. Special Rooms

DECISION:

Special rooms should be central to the classrooms.

c. Administration, Supervision and Research

DECISION:

Administration, Supervision and Research should connect with a location central to the classrooms and with the west side of the stream bed, that is, it should cross the stream bed.

d. Playground

DECISION:

Playground should be subdivided into separate areas for different age groups. They may be on the west side of the stream bed—one playground site may be on the east of the stream bed at the south of the property.

e. Project Area

DECISION:

Project area should be in the stream bed itself and on the adjacent banks at the north of the property and toward the south of the property near classrooms.

f. Nursery and Kindergarten

DECISION:

Nursery and Kindergarten should be on the west side of the stream bed to the north of the site. No teaching rooms should be on the west side of these buildings.

The Nursery should be north of the Kindergarten.

g. Parking and Access: (Administration, Nursery and Kindergarten, Classrooms and Auditorium)

DECISION:

Automobile access to the property should be from Sunset Blvd. approximately centered between the two curves on Sunset.

A driveway should be provided into the property and out of the property separately, with one way traffic encouraged.

Automobile parking should be located adjacent to this access.

Nursery and Kindergarten pupils should be discharged on the property, not from cars parked on the curb on Sunset.

Pedestrian access for University students should be provided from a point northeast of the Women's gym.

h. Service

DECISION:

Service entrance should be provided northeast of the Stone Canyon Culvert from Sunset Blvd. to run along the bank at the east of the property.

i. Other elements

DECISION:

Location of Auditorium is left open for further study.

Open-air Theatre should be in ravine at the east of the property. Kitchen might be placed adjacent to it.

At this point meeting was continued until 11 a.m., Friday, December 13th.

4. Form:

a. Story Height

(1) Should all rooms used frequently by children be on ground floor?

DECISION:

Yes

(2) May some rooms used mainly by adults be on second floor? (Specify)

DECISION:

Yes

Rooms used by University students may be on second floor.

b. Classrooms:

(1) To what extent should classrooms be separated?

DECISION:

Classrooms should not have party walls.

An ideal arrangement would have the advantages of separate bungalows connected under cover.

(2) How should classrooms be oriented? (Sunset Blvd., stream bed, bank)

DECISION:

The main light to classrooms should come generally from the north, but additional light is desirable.

Outdoor teaching areas, outside the classrooms, should be sheltered from Sunset Blvd. and the stream bed.

5. Circulation:

a. How should classrooms be connected?

DECISION:

A sheltered connection open on one side is desirable.

b. Should classrooms, special rooms, administration, supervision, research, be connected under cover?

DECISION:

Yes

c. Should kindergarten and nursery be connected with each other or with rest of plant?

DECISION:

It is not mandatory, but is desirable.

d. Should auditorium, if any, be connected?

DECISION:

It is not mandatory, but is desirable.

e. Are distances travelled satisfactory?

DECISION:

Yes

6. Plan: Is Master Plan Diagram resulting from previous decisions approved?

DECISION:

The attached Master Plan Diagram is recommended and approved.

D. SCOPE OF CURRENT PROBLEM

1. The Executive Architect gave the following breakdown of approximate area requirements.

a. Nursery	5,490	
b. Kindergarten	3,634	
c. Classrooms—4620/cl	27,720	
d. Special rooms	7,158	
e. Adm. Supervisory and Research	7,648	
TOTAL	53,650	(except Add. Requ.)

2. Budget:

The Executive Architect discussed the budget for construction established by the existing appropriation.

3. Analysis:

a. Can requirements and program be reduced sufficiently to build a minimum but complete *Laboratory* School adequate for its use?

DECISION:

No.

b. Can complete adequate Grade School (Classrooms) be built within budget?

DECISION:

No.

c. Should area requirements and Master Plan for future development be retained as agreed upon, and scope of Current Program restricted to budget?

DECISION:

Yes.

d. What parts of total program should be built with current allocation?

DECISION:

After discussions led by Dr. Morrisett, the Committee agreed to recommend the following priority of construction:

(1) Administration	7,648	16,888 sq. ft.
4 classrooms	9,240	
(2) Special rooms		7,158
(3) 8 classrooms		18,480
(4) Kindergarten		5,634
(5) Nursery		5,490
(6) Other (auditorium, kitchen and dining, etc.)		12,762

E. The meeting was adjourned until preliminary studies of the current problem are ready for presentation by the Executive Architect.

THE NEW PLANT PLAN FOR WAYNE UNIVERSITY

By ARTHUR NEEF

Provost, Wayne University

Receiving his A. B. and Doctor of Jurisprudence degrees from the University of Michigan, Arthur Neef practiced law for seven years. During the last three years of that period he became Secretary of the Law School, now part of Wayne University. From lawyer to law educator, Dr. Neef became Dean in 1937 and at present is Provost of the University. His hobby used to be photography; now, apparently, it is building programs. Once in awhile, to satisfy his nostalgia, he writes an article on some legal subject.

WAYNE UNIVERSITY is made up of 12 schools and colleges, the oldest of which dates back to 1868. Its greatest growth, however, stems from a junior college program which just prior to 1920 had been added to the program of Detroit's principal high school. Because of a change in the character of the neighborhood, which in the early part of this century had been one of Detroit's finest residential districts but gradually has been infiltrated by rooming houses, convalescent homes, professional offices, etc., the high school enrollment continued to decline.

As more of the building became available additional college courses were given, and in 1923 a four-year Liberal Arts College was established. Subsequently Pharmacy, Law, Engineering, Graduate, Public Affairs, Social Work, General Studies, Nursing, Occupational Health, and Business Administration schools and colleges were added to the nucleus of Medicine, Education, and Liberal Arts; and enrollments increased steadily to a prewar peak of 16,000 full and part-time students. Classes were held from 8 a.m. to 10 p.m., and no distinctions were made in student credit or faculty participation between morning, afternoon or evening classes. Now, with increased improvised facilities and temporary buildings, several thousand additional students are in attendance, and the pressure on our physical facilities is greater than ever.

Control and Support

The university is under the control of the Board of Education of the City of Detroit. Its general support comes from the local school taxes; however, some additional support is received from the county, and in recent years from the State of Michigan. Fees are uniform for all residents of the state, and are about the same as those of the state university. Executive management is entirely in the hands of university officials, and the university budget is set up separately from the general budget of the school system. The university's gross operating budget exceeds $5,000,000, of which approximately 40 per cent is derived from student fees.

At present Wayne University is housed principally in a structure which was originally built as a high school for 2,500 students fifty years ago. The old residences in an adjoining three block area have been converted into classrooms and offices, and "temporaries" have been placed in every open space. Two of the colleges, Medicine and Pharmacy, occupy quarters in downtown Detroit not far from the City's Receiving Hospital. Current enrollment is 18,000 students; not all of them, however, carry a full program.

Expansion Program

The present expansion program had its inception in 1936 when a Citizens' Committee filed its report after studying the housing needs of the university.

Serious questions had been raised as to whether such an expansion should occur in connection with the then principal activities conducted in the former high school building, or whether an entirely new location should be decided upon. The principal factors favoring the existing site were as follows:

1. The metropolitan area is roughly a half circle with a radius of ten or more miles. This site was in the central sector and within two miles of the hub of that circle, easily accessible by existing public transportation and arterial highways. It was (and still is) close to the population center of the metropolitan area.
2. The main building was old, but still quite serv-

iceable, it could be replaced only at a cost of several million dollars, and no money was available for that purpose.

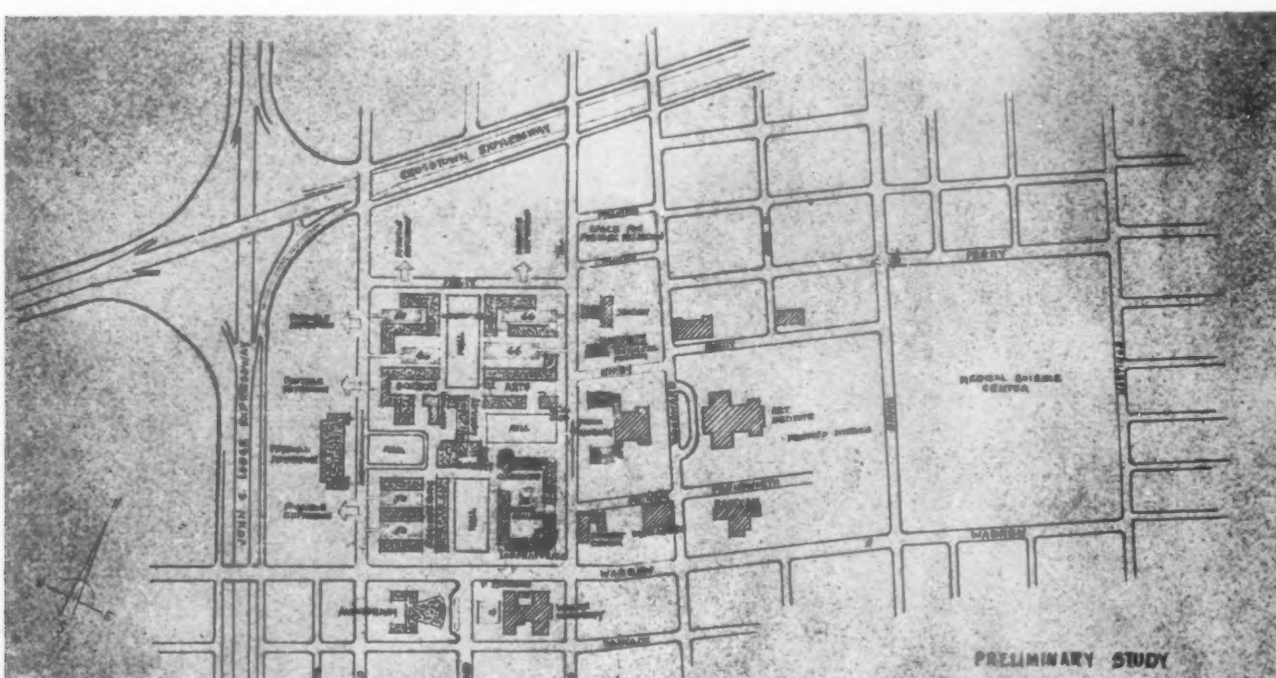
3. The area adjacent to the main building was largely residential, could be acquired by stages through the process of eminent domain, and would not be prohibitive in cost if the major structures were integrated in the plan.
4. The Detroit Public Library with its principal collections, including the Burton Historical Library and the Technological Library, was only a block away.
5. The Detroit Institute of Arts, containing all of the public art collections of the City, was directly across Woodward Avenue from the Library.
6. Several music conservatories, Merrill-Palmer School, and the University of Michigan Extension program were housed in this same area. (The latter program is now housed in the Rackham Building, a large modern building costing several million dollars.)

Definitely in favor of a new site was the possibility of acquiring a large open space in a less settled area, with resulting savings in costs, and, presumably, with an opportunity for a more spacious and pleasant campus. These factors were not deemed sufficiently important to counterbalance those given above, and the committee recommended the acquisition of the three blocks directly adjoining the existing building.

How the Plan Grew

The recommended three block area has since been acquired. However, in 1942 the Board of Education had a competition for the selection of an architectural scheme for a campus plan and the appointment of an architect for a proposed student center building. In selecting the winning campus plan the jury of award, which included Dean Joseph Hudnut of the Graduate School of Design of Harvard University, Dean W. R. MacCornack of the School of Architecture, Massachusetts Institute of Technology, and F. R. Walker of Walker and Weeks, Architects, Cleveland, Ohio, indicated that the three block area was insufficient for the facilities which the university proposed to include. This fortunately came at a time when the city's increasing interest in the university and in long-range planning in general, made it possible to suggest that the area be expanded. The proposed construction of two depressed super-highways, which would intersect just northwest of the campus area, offered a natural boundary for a campus area of about 85 acres. The City Plan Commission enthusiastically endorsed the suggestion, and it was approved by the public agencies whose support would be necessary if it were to be realized.

Accordingly, this area was set aside in the public improvement program as the expansion area for Wayne University, and the legislative body of the city directed that no other public or private improvements in the area could be made without being expressly approved in the light of the university program. This, I might say parenthetically, keeps me busy certifying that the university has no objection to specific proposed alterations and minor additions to existing structures. In the one instance of a demand, backed up by legal proceedings, for the right to build an entirely new structure on a vacant plot, the university



countered by acquiring this plot by eminent domain proceedings. A major improvement to an existing commercial enterprise was proposed, but it would have been an expansion of a non-conforming use under the zoning ordinance, and the city legislative body supported the university's opposition to its being permitted.

Our Planning Efforts

During the war years construction was impossible, so a university committee, with representatives of each college and major curricular interest, had plenty of opportunity for long-range studies. Population trends for the metropolitan area, with a breakdown as to the number of persons in each age group was a starting point. A study was made of enrollment data and trends in the several departments and colleges over the last decade, and a comparison made of our experience with that of other institutions. A projection of future national and local trends and educational demands was formulated. A study was made of the distribution of enrollments, and of class and laboratory use for each period and each day, and a determination made of the maximum use reasonably possible for a given amount of facilities. Studies further were made of the university college and departmental organization, and an attempt made to have the varied inter-relations of the several departments, service units, colleges and community agencies defined. There were long discussions on methods of minimizing student traffic, and on planning, locating and housing university facilities in order to permit their being shared on a common basis to a maximum degree to avoid unnecessary duplication. Finally studies were made to determine what facilities were most critically needed and what priorities should be established in our building program.

These discussions ranged from such practical questions as the cost and feasibility of air conditioning and adequate space for parking lots, and from such details as blackboards, lockers, etc., on the one hand, to such intangible considerations as the relationship of the university to the community and the manner of exemplifying this in the campus plan and architecture.

Need for an Architect Realized

The committee, however, realized its professional limitations and accordingly requested a land use study and the appointment of a university architect. Before this was acted upon, a further suggestion was made for the creation of a Board of Architects, inasmuch as the specific plan which had won the competition had already outlived its usefulness, and a similar fate was probable for any static plan. Quoting from the committee's report:

"The sheer magnitude of the problem of conceiving and designing the entire campus of a university and the vital role of such a campus in the future of the university and the city would justify insistence upon the best collective architectural wisdom available.

"Moreover, it is impossible fully to predict for even the near future the amount of endowments or public funds for capital improvements, the enrollments and curricular developments, and the possible expansion into entirely new fields of university research and instruction. These uncertainties prohibit any static university planning, and therefore would nullify the attempt completely to design in the present a campus adapted to the future functions and potentialities of the university.

"At the same time, we cannot afford to permit such a campus to develop haphazardly and with no attention to fundamental inter-relations and the need for physical and educational correlation of the university units.

"Accordingly, to avoid over-rigidity on the one hand and mere opportunism on the other, we believe that the university campus should be regarded as a growing organism; that its development should be guided and controlled by a group of experts whose crystallization of our educational objectives into architectural forms can meet these ever changing conditions without sacrificing continuity, structural harmony, and a basic spiritual unity."

Our governing board approved this suggestion and a three man Board of Architects was appointed. The Board of Architects made a thorough study of campus developments elsewhere, with special emphasis on those located in urban centers. It reviewed the information available on the probable number, size, and use of buildings which should be included in the development of a master plan, and it adopted recommendations as to the basic principals governing heights of buildings, style of buildings, and construction materials, "in order to provide for harmonious development of the entire area." It also specifically reviewed the plans for the Student Center Building, which was the most immediate construction in hand.

Although this board did not succeed in establishing a master plan, it did provide a basis for appraising the subsequent plans for specific buildings. It recommended that buildings generally be three stories high above grade; that first floor levels be established one step above finished grade; that generally buildings be designed as flat-roofed structures; that buildings be of smooth self-cleaning brick in light shades and warm color; that stone used for trim be of warm color with hard impervious surface similar to Mankato stone. Further, it completely supported the theory that the buildings should not be bound by traditional styles in college architecture, but "should express contemporary thought in planning, design and structural methods." It was further stated that "harmony of the group as a whole should be achieved by a proper use of the materials within the general pattern" established by the items mentioned above, and that "architects should have freedom to express contemporary trends in design as they exist at that time. Architects should not be required to adhere to a repetition of the external features of design which may appear in the first few buildings to be erected if such features should not be compatible with future thought."

Because of the considerable expense involved, and because of certain other factors which are not relevant to the potential usefulness of such a board, the Board of Architects has not been continued. The Student Center Building, which was then immediately in prospect, had to be abandoned because of the great increase in costs at the time building operations could be resumed after the war period. The development in this connection is another indication of the impossibility of close adherence to a fixed plan.

Making Use of Material at Hand

Adjacent to the campus area was an eleven-story building originally designed as a bachelor apartment hotel. It included a swimming pool, which the university was renting, a dining room and coffee shop, largely patronized by university faculty and students, and it had about 650 "guests." Having gone through

various financial vicissitudes, resulting in proceedings under Section 77B of the Bankruptcy Act, it seemed possible to acquire the building at a reasonable price.

The building was adaptable to use as a Student Center and Dormitory, and the combined income from student fees and room rentals was believed to be adequate for financing a revenue bond issue. The building was acquired and is now in use except for the dining room facilities. These should be available as soon as the equipment can be installed, probably within a a few months. The entire project, including remodeling, new furniture, and the acquisition of an adjoining area for a parking lot, will cost less than two million dollars, and undoubtedly could not be duplicated for more than twice that amount at current building costs. It also serves to extend the campus area eastward, parallel to the public library.

The latter development in turn encouraged the extension of the campus area eastward along the north side of the library; with the result that the Detroit Historical Museum, which is affiliated with the university, is now to be constructed at that point.

The interest developed by the university program, and the need of integrating the various cultural activities located in this general area, caused the City Plan Commission to contract for the development of a Cultural Center Plan embracing the proposed university campus, the Public Library, the Art Institute, the Rackham Building, the Historical Museum, and several other museums, which taken together would comprise an area of about 150 acres. We now have a Cultural Center Committee, with representatives of each of these agencies, and there is close cooperation in the interests of our total joint program.

Current Planning

In 1946 the legislature recognized its obligation to aid in furnishing educational opportunities for the veterans returning to this metropolitan area and the inadequacy of the university facilities for increased enrollments, and appropriated the sum of $2,700,000; $900,000 of which was allocated to a Classroom Building and $1,800,000 to a Science Building. Mr. Suren Pilafian was commissioned to design the former and Mr. Ralph Calder the latter. These buildings had to be located on the land already owned by the university, and these two architects working with myself finally agreed upon the exact site for each building. But before reaching this decision it was again necessary to agree upon some general campus plan, and the scheme currently accepted is the one marked "Illustration I."

The following comments accompanied the recommendation of this scheme, and in general indicate the reasons for its adoption.

The plan in general is as compact as is consistent with the need for providing an appropriate setting for the individual units. It thereby provides ample space at the north and west peripheries for athletic fields, parking spaces, and future expansion. Off-street parking spaces have been provided immediately adjacent to each unit. Vehicular access has been provided to each unit. By diverting traffic from Second Avenue a serious traffic hazard has been eliminated.

In spite of this compactness, a feeling of spaciousness has been achieved by the four malls which open the plan to the thoroughfares on each side of the area and which thereby integrate the plan with the principal features surrounding it. The mall on the east integrates the group with the Public Library and relates, spatially, the University Library therewith. It also provides a principal entrance to the campus from Cass Avenue. The south mall terminates the vista along Second Avenue, relates the group to the existing Main Building of the university (an important entrance to this building can be introduced on its west side when the present obsolete power plant has been removed), and to the University Auditorium placed on Second Avenue. It also provides a principal entrance to the campus from Warren Avenue. The west mall relates the group to the Physical Education unit and provides a principal entrance from Third Avenue. The north mall provides a spatial relationship with the towering Fisher Building a short distance away. These malls are so located as to utilize existing trees along streets.

The shapes of the various units have been determined by an attempt to make the north-south orientation a predominant one for most of the rooms in the group, since that is considered preferable to an east-west orientation.

Selection of Building Locations

The plan comprises the following elements, each of which has been grouped and located on the basis of expected student traffic and departmental interrelationships:

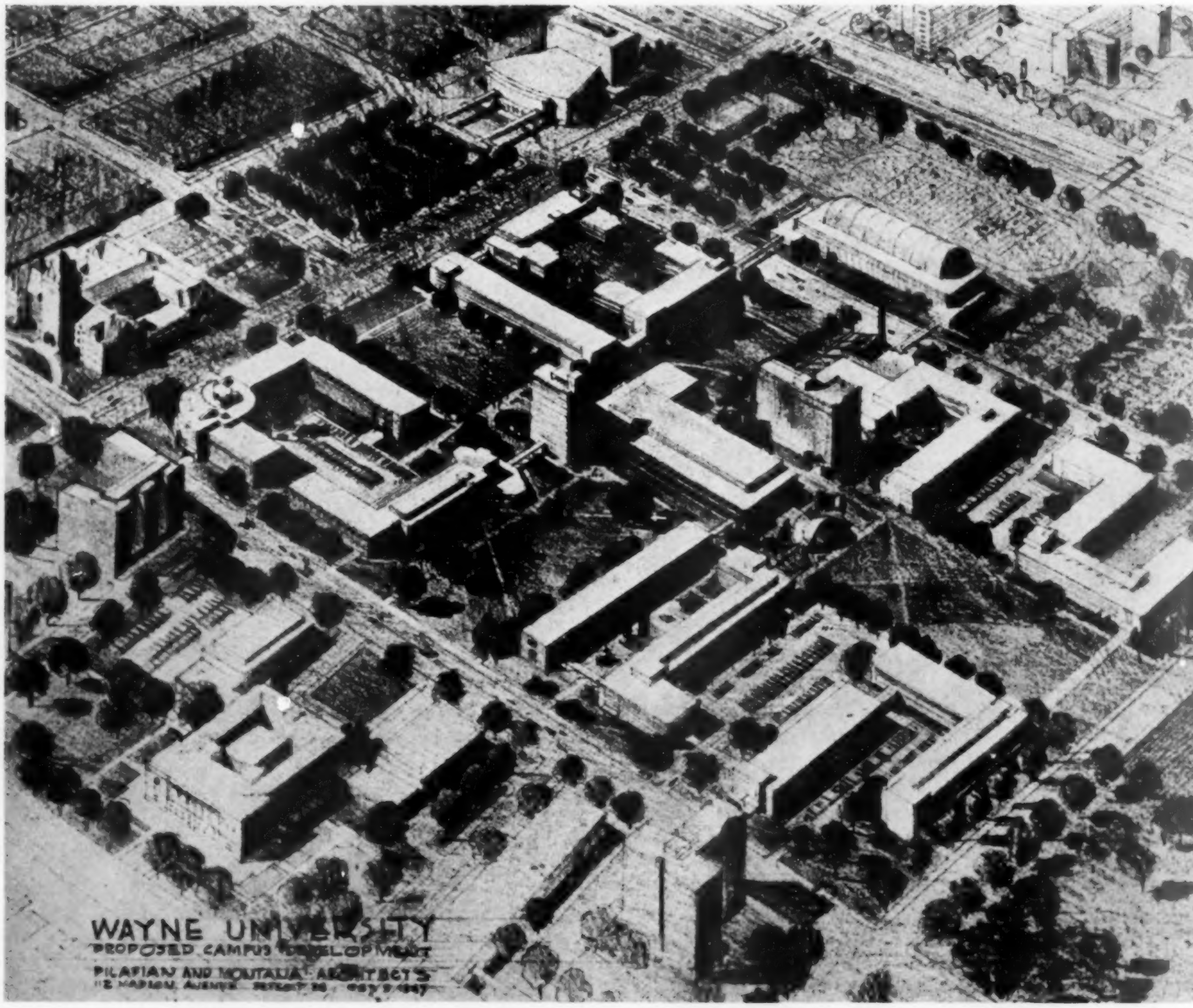
Library—Centrally located. Focal point of entire composition. Closely related to proposed Classroom Building. Space provided for growth of library to ultimate size shown.

General Classroom and Science Building—Since these buildings were to be erected immediately, they were necessarily located on property owned by the university. But also they are near the present Main Building, near Webster Hall, the Student Center and Dormitory Building, and near the intersection of Cass and Warren Avenues, which is the most used approach to the campus area at present. Further expansion space will be provided in present Main Building as departments are moved out of it into future new buildings. It was considered desirable to allow for future additions to either of these new buildings and to allow for the future widening of Cass and Warren Avenues.

It was also necessary to provide for the continuation of Second Avenue for the indefinite future. If it were considered desirable, it could be made the basis for a junior college unit with its own central court. The Classroom Building is located in the northern part of the grouping, in order to be closer to the location of the Library and the Humanities buildings. The buildings in black in the campus area in Illustration I represent the structures now being erected.

Historical Museum—Located just off the campus proper in order to be more accessible to Woodward Avenue, related to the University, the Public Library and the Art Institute, but not to interfere with the circulation between the educational units of the University.

Fine Arts—Placed as close as possible to Art Institute. Further expansion can be provided by demolish-



Buildings in the new development are arranged in departmental relationship to one another.

ing the "News Building"; a building of considerable size now housing the Law School.

Engineering—Located in southwest area in order to be close to the Sciences and the "Junior College unit" without preventing Fine Arts from being close to the Art Institute. These advantages outweigh the advantages of placing the unit on property already purchased. Further expansion space provided westward.

Sciences—Located between Engineering and Humanities. Further expansion space provided westward.

Humanities—Placed in north area, close to Sciences and the Fine Arts. Further expansion space provided northward and westward.

Physical Education—Located adjacent to athletic fields and as close as possible to center of the campus. Propose erection of overpasses to permit safe crossing of Third Avenue thereto.

Present Main Building—Propose retention for ultimate expansion of the Junior College and for administration and service offices.

Department Offices—Propose location with respective teaching units.

Chatsworth Apartment Building—This is a large apartment house, quite modern, and by reason of its value (possibly $1,000,000) assumed to remain. Propose ultimate acquisition for use as faculty or student residences.

Administration Offices—Propose housing in present Main Building or in tower connected to University Library.

Power Plant—Propose use of central heat. But a plant may be erected at the southwest corner of the area, if required.

Auditorium—Located off the campus proper because of probable use by large public audiences. Accessible from Warren, Second, and Third Avenues. Parking space available on blocks immediately to the west and to the south.

Stadium—Area assigned to university not adequate for inclusion of stadium. Propose locating elsewhere in city.

Classroom Building

The Classroom Building was the first one to be completely planned, and I use it to illustrate the care

with which the program was formulated and the details for its construction worked out. The program required that the building house classrooms which would be available to all colleges and departments. Therefore, no departmental offices were to be included, and yet the design had to permit for the addition of a fourth floor to accommodate such offices when more adequate housing of the university permits the building to be allocated to specific departments.

The building will have a gross volume of 786,000 cubic feet, and it will provide fifteen classrooms seating thirty-two, and ten classrooms seating forty each. Further, since one of the most urgent needs was relatively large-sized lecture rooms, one such room seating two hundred fifty and three seating eighty each were included. Study lounges were located on each floor above the first, because it is not uncommon in urban universities, where students live beyond walking distance from the campus, for students to arrive considerably before class time. Also since there would be no faculty offices, a centrally located faculty lounge was imperative.

The necessity for retaining all facilities currently in use resulted in the buildings being set sufficiently back from the street line to avoid having to demolish existing houses until they could be replaced by the new buildings. This will also preserve the existing street with its large shade trees as the basis for a mall when the intervening houses have been removed. Since classrooms would be used almost continuously from early morning until after sunset, the problem of shading direct sunlight in order to reduce brightness contrast within the rooms was most important. The best exposures would be the north and south, and all classrooms face one of those directions. To reduce the objectionable aspect of the sun's rays from the south, directional glass blocks on the upper parts of the windows were provided to reflect the direct rays of the sun upward toward the ceiling. (Window shades and adjustable metal louvers were considered less serviceable and more expensive.)

The location in relation to other projected buildings made it necessary to provide direct access from all four sides, and all the entrances lead in a straight line to a centrally located lobby. Moreover, the architect was asked to include in his design some method of separating the large lecture rooms and the necessary attendant public conveniences from the remainder of the building to permit their independent use.

To eliminate the infiltration of dust as much as possible windows are almost entirely fixed with but a small vent being provided in each bay for emergency use. This feature, and the large extent of glass block used on the south side, made it necessary to provide a convenient means of cleaning the outer surface of the windows. We believe this has been accomplished by incorporating a continuous monorail under the roof canopy around most of the building, from which an electrically operated cab will be suspended by cables. When the cab is not in use it will recess into a room within the building without removal from its track. So far as I know, this is an innovation in buildings of this type, and I think the architect has been most ingenious in working out this scheme. (More specific details on this point can be secured from the architect, Mr. Suren Pilafian, or from the writer.)

The lecture rooms were designed to provide ideal conditions for visual education methods. There are no windows, therefore no blackout problems. The shapes of the rooms and the profiles of the floors were determined entirely by the requirements of sight lines to the projection screen. Seating is provided by fixed swivel seats placed behind continuous radial tables, and the rows of seats are spaced far enough apart so that as many as twenty-six seats can be provided without an intermediate aisle. Acoustic qualities will

WAYNE UNIVERSITY CLASSROOM BUILDING

be aided by non-parallel cinder block walls in the seating areas and Keene's cement walls at the front.

At the front walls of the classrooms the blackboard panels are placed in a considerably higher position than is customary in order to improve visibility from all parts of the room. The bottom of the blackboard is four feet above the floor and the top, eight feet; and a movable platform is provided for the use of the instructor so that he can reach the upper parts of the panel. Blackboards on other walls will be at the usual height.

The structure is a reinforced concrete skeleton. Exterior walls will be of dark gray face brick, which after long study and repeated experimentation was concluded to be the most harmonious, economical surface in an area already dominated by marble and limestone structures. At the entrances will be simple areas of Mankato stone. The only piece of ornamentation in the entire project will be a panel of stone sculpture on the north facade near the principal entrance, set off by an uninterrupted expanse of brick. Canopy fascias, copings and other trimming are to be of aluminum. There are many other details of the building which could be related with profit, but space does not permit.

Science Building

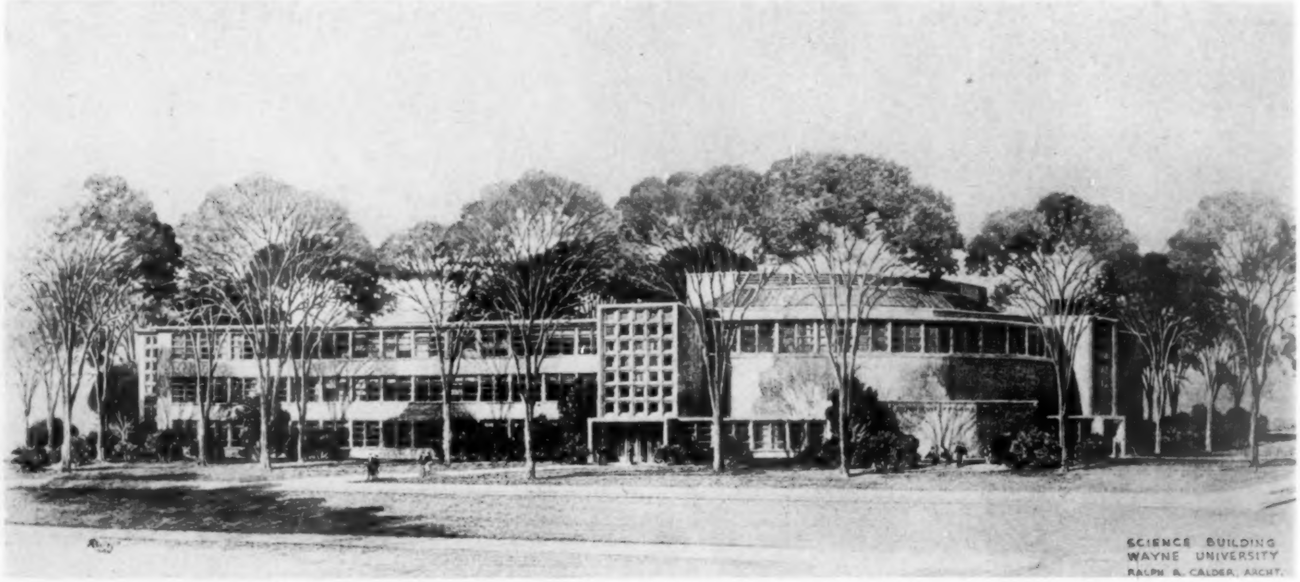
The same considerations applied to this building. It will have approximately 1,500,000 cubic feet, and the space will be allocated to the basic work in chemistry, physics, botany, zoology, biology, and psychology. The building will be three stories high with a partial fourth floor used as a greenhouse.

Exterior surfaces and fenestration will be similar to that of the Classroom Building. This we insisted upon because the anticipated additions to these buildings will bring them into close proximity. The architects were cooperative, and it was possible to secure a joint decision on such important factors as face brick, stone trim, and fenestration. However, there was no attempt at exact duplication in other architectural features, and the general design and exterior treatment of the building were determined by the interior layout and the architect's individual expression of the building's functions, subject only to certain basic considerations.

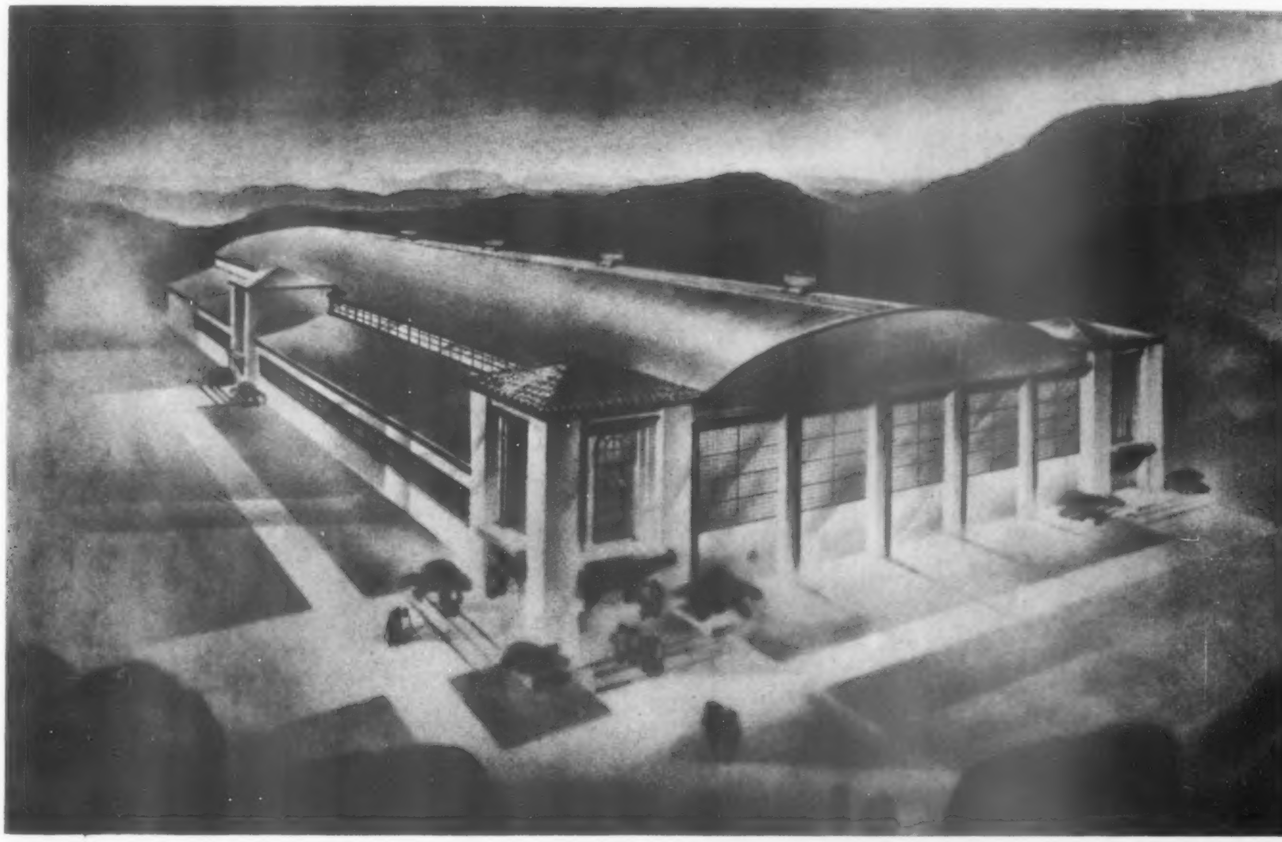
Without detailing the various laboratories, lecture halls, etc., it suffices to say that the layout and equipment requirements for each one were determined only after repeated discussions between the architect and the departments concerned. Adjustments between departments and final decisions on space and equipment specifications were left to me as the university representative. Economy in construction and serviceability in use were the prime considerations. Problems concerning the convenience of student circulation, the possibility of using the lecture rooms for nonscience groups, feasible methods of receiving, storing and handling inflammable and explosive chemicals, and the avoidance of contaminating fumes were given careful consideration, and, we hope, solved.

Summary

The transition from the broad general bases of campus planning to the detailed practical specifics of individual buildings is an interesting journey. If the plans for Wayne University prove successful, the credit will be shared by numerous individuals, ranging from the faculty member with the germ of an idea to the architect with the finished working drawing. Function and program must determine any suitable plan for a building, or a group of buildings. Long-range studies as well as the clairvoyant gift are necessary for even moderately accurate predictions of the changes to come. A developing concept of the university's relations to its students and the community is essential to the realization in appropriate forms and materials of the functions to be served. These things we have tried to keep ever in mind, remembering the fallibility of human judgment and the necessity of keeping every plan dynamic to meet with the ever changing patterns of human relations and institutional purposes.



The architects of the Classroom and Science Buildings cooperated to achieve a unity of style.



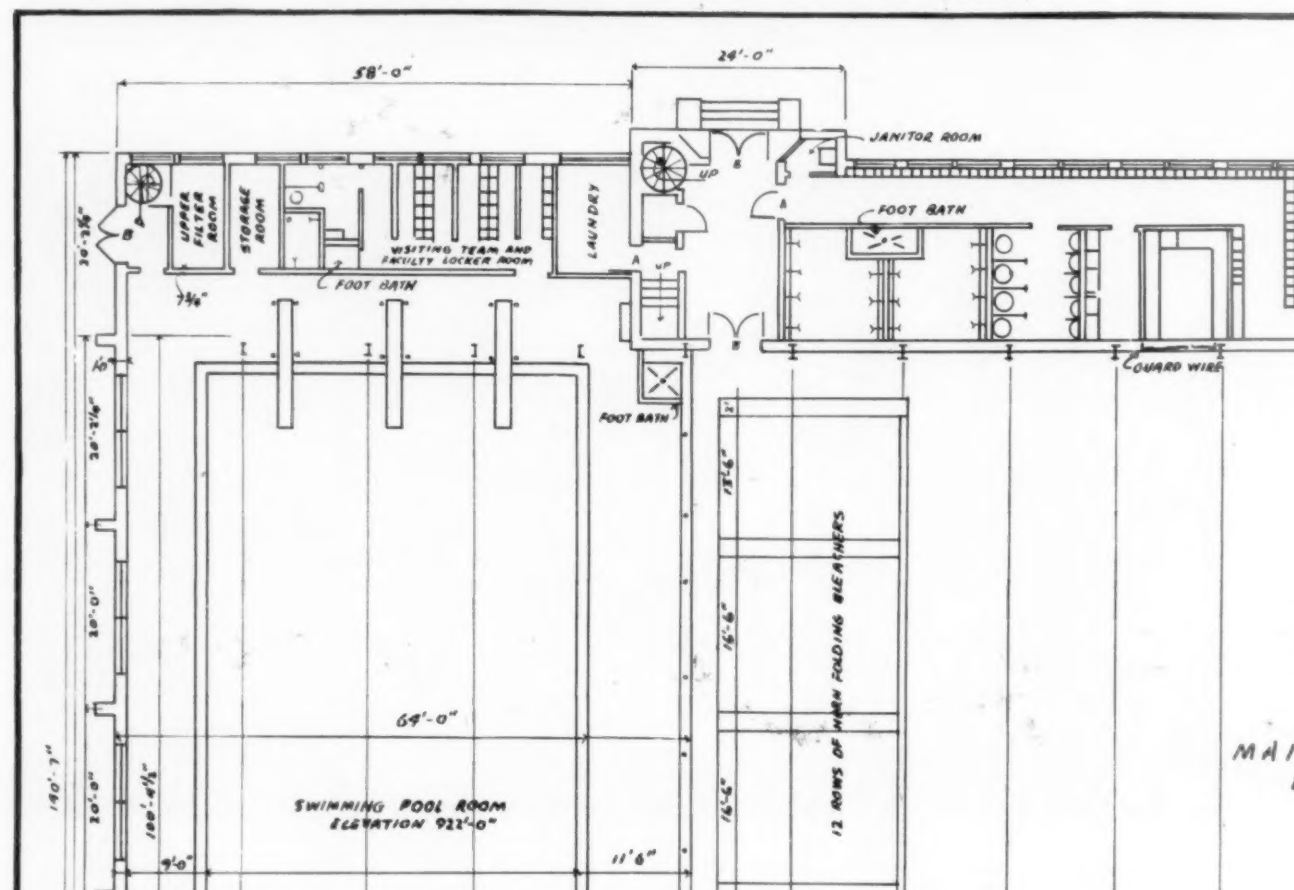
IN THE TWILIGHT OF TRADITION

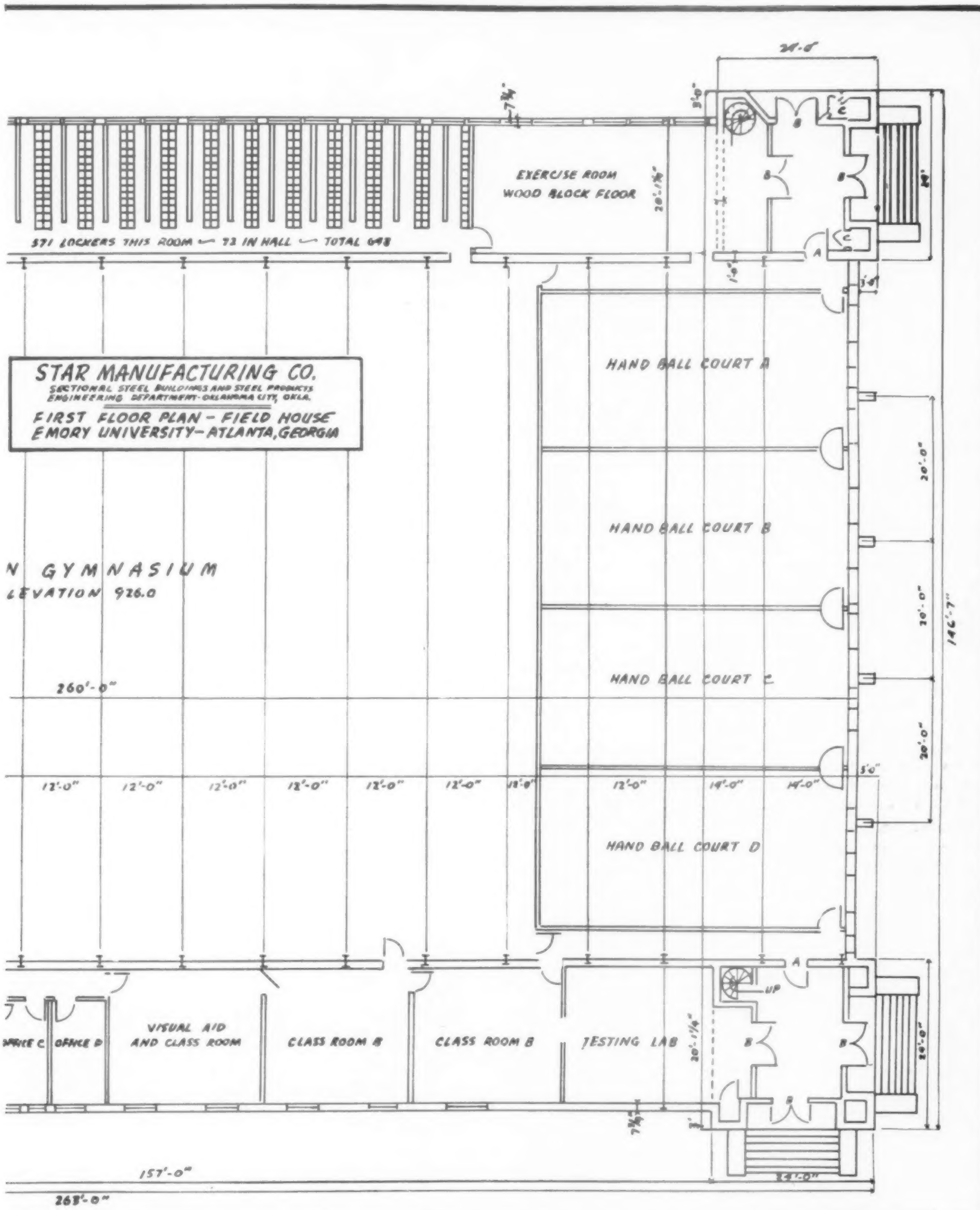
By G. H. MEW

Treasurer and Business Manager, Emory University, Georgia

Mr. Mew attended Georgia School of Technology and secured a B.C.S. degree from New York University. He organized the Southern Association of College and University Business Officers, and is a member of the National Committee on Standard Reports for Institutions of Higher Education.

MANY of you who read this article may wonder at first why I have chosen the title, *In the Twilight of Tradition,* to describe the construction and use of a standard prefabricated airplane hangar for a University fieldhouse or gymnasium. This choice is based on the feeling that many of us who have spent most of our active careers in planning, developing and managing our various programs on college and university campuses have grown and have lived in the old traditions of the past to perhaps a far greater extent than we realize and to a greater extent than we should. Many of us in the field of education are resistant to change—especially change from the traditional type of expensive buildings, with their massive columns, front entrances, foyers, loggias, wide and spacious halls, etc., which are not of much practical value as an educational plant, to light, flexible, useful buildings of simple design and of economical construction. At many institutions, especially those public institutions where buildings are built with tax money, many of the massive structures with so much wasted space in them are political monuments to architects,


JANITOR ROOM
UPPER FILTER ROOM
STORAGE ROOM
VISITING TEAM AND FACULTY LOCKER ROOM
FOOT BATH
LAUNDRY
GUARD WIRE
12 ROWS OF NARN FOLDING BLEACHERS
SWIMMING POOL ROOM ELEVATION 922'-0"
BLEACHERS
FOOT BATH 2
GUARD WIRE and GLASS
TO FRONT HALL
MIRROR
TOILET-BATH
SHOWER ROOM
GIRLS LOCKER ROOM
82 LOCKERS
GEAR ROOM
VEST. TOWER A
GENERAL OFFICE AND WORK ROOM
OFFICE A
OFFICE B
58'-0"
24'-0"
64'-0"
140'-7"


STAR MANUFACTURING CO.
SECTIONAL STEEL BUILDINGS AND STEEL PRODUCTS
ENGINEERING DEPARTMENT-OKLAHOMA CITY, OKLA.
FIRST FLOOR PLAN - FIELD HOUSE
EMORY UNIVERSITY - ATLANTA, GEORGIA
371 LOCKERS THIS ROOM — 77 IN HALL — TOTAL 648
EXERCISE ROOM
WOOD BLOCK FLOOR
HAND BALL COURT A
HAND BALL COURT B
HAND BALL COURT C
HAND BALL COURT D
N GYMNASIUM
LEVATION 926.0
260'-0"
157'-0"
263'-0"
146'-7"
VISUAL AID AND CLASS ROOM
CLASS ROOM B
CLASS ROOM B
TESTING LAB
OFFICE C
OFFICE D
UP

politicians, and public building committees.

Many of us view with reverence time-honored buildings on our college and university campuses. These old buildings were constructed during periods when the cost of labor, materials, and maintenance was much lower than it is today. Because "our fathers built them that way" is no reason why, in an atomic age, we should continue to build them that way. Such a philosophy too often blocks the path to simplification of structure with attendant lower cost of construction, more useful space, and more economical maintenance and housekeeping.

The Pattern Changes

For years the general pattern of industrial construction has been shifting from compact, tall structures with many floors and elevators to the sprawling and more economical one-floor type of plant. It is, therefore, with this innovation in mind, that we at Emory University went about purchasing a standard size, prefabricated airplane hangar and converting it into a modern, useful, flexible, and efficient physical education laboratory in which to promote and carry forward Emory's unique physical education program.

I realize that for urban colleges and universities in thickly populated areas where land is expensive and difficult to obtain, the physical education plant about to be described is out of the question; but for those institutions where the amount of land to be used is no particular problem, the use of this type of building may be of some interest.

This building is a steel, brick, and concrete structure, measuring 260 by 140 feet, which overlooks three beautiful athletic fields. It will contain three basketball courts, an approved championship swimming pool with movable bulkhead, exercise rooms, handball courts, practice rooms, classrooms, offices, locker and storage space, a laundry, and special rooms for remedial physical education and testing.

The trusses over the main playing arena are 22 feet high and 100 feet long, thus providing an open playing area of 20,000 square feet without obstructions. Over the swimming pool the trusses are 100 feet long and 26 feet high. On each side of the main arena are lean-tos 20 feet wide by 260 feet long. In the floor plan of the lean-to areas it will be noted that adequate shower and locker rooms for a student body of 4,000 students are provided. Shower and locker rooms for men are located on one side of the building and those for women on the other side. Entrances from the shower and locker rooms directly to the swimming pool and playing arena are provided, thus making it unnecessary for either group to come in contact with the other before entering the sports arena or the swimming pool area. There are also provided in the lean-to areas three regular classrooms, a visual-aids room, and one exercise room, as well as adequate offices for the physical education director and his staff.

The four main entrances to the building are through the ground floor of the four towers shown on the sketch. The four towers are 20 x 20 feet square and two stories high. The primary purpose of the towers is to blend the exterior architectural pattern of this building into the general and overall architectural design and beauty of other buildings on the campus. The second floor of each tower provides an office 20 x 20 feet, thus providing additional space for added personnel as the physical education program expands.

Advantages in Costs

There cannot, of course, be much comparison between the construction costs of this type of building with the older or conventional type of gymnasium which is common to so many of our colleges and universities. The conventional type of gymnasium is sometimes as high as three to five stories with full basement. Many of these older types have basketball courts on the top floor, some with swimming pools on the second floor. Many such buildings do not have as much available and useful area as the building herein described, yet the cost of such buildings may be two or even three times the cost of a fieldhouse such as Emory's.

Think of the foundations necessary to support a three to five story building. They must go deep into the earth, must sometimes be three to five feet wide in order to support an eighteen inch to two foot wall. The cost of such foundations, in which tons of concrete and reinforcing steel are used, is far greater than the cost of foundations for a light, flexible one-story building with an eight-inch or twelve-inch wall.

In the construction of a specialty building such as the conventional gymnasium the architects and engineers must provide special drawings and specifications for the construction of all steel trusses, cords, columns, purlins, braces, etc. The steel plant must then manufacture these items to fit a particular place in a particular building. These costs are obviously much greater than the costs which go into a standard-design prefabricated building produced on a quantity production basis. It is like going into a store and buying a pair of ready-made shoes instead of having a pair of shoes tailored to meet one's particular fancy. Obviously, the standard shoe manufactured on a quantity production basis is much less expensive than the pair of shoes especially made to meet one's own requirements. Similarly, the comparison of the cost of the prefabricated building with the cost of conventional type of gymnasium was of tremendous influence in Emory's decision to break away from the bonds of tradition in putting up a prefabricated building for a fieldhouse or gymnasium.

The decision to purchase the building which we are discussing was made and the order for it was placed before the architects and engineers were consulted. They were, as was expected, very cold to the idea at first, but are now, I believe, quite enthusiastic about it.

The foundations for the building were then designed by the architects and built by contract. The firm from which the building was purchased sent its own experienced construction crew and erection equipment from Oklahoma to Atlanta to erect the building on the aforementioned foundations. Here we find another substantial saving in the cost of erecting the steel superstructure of a prefabricated building. The construction of the remainder of the building, with the exception of the swimming pool, is being carried on by the University without the aid of a general contractor.

The walls along the line of steel columns between the main playing arena and the lean-to areas are eight inches thick. They are built of brick to a height of

seven feet from the floor level and capped with a row-lock course of brick. The walls above the seven foot level are built of cinder block and sprayed with white paint. The exterior parallel walls are of the same construction, with stucco finish and limestone trim. The end walls, which are approximately thirty feet high, are twelve inches thick, and of the same type construction as the side walls, with glass blocks instead of windows added for light. The base for the floor consists of a bed of crushed rock four inches deep spread uniformly and rolled with regular highway equipment over the entire area to be floored. This bed of rock was then thoroughly impregnated with hot asphalt to seal out all moisture. On this rock base was laid and rolled into the crushed rock and asphalt, two inches of regular asphalt topping mixture such as used in ordinary highway construction for finishing the surface of roads. Creosoted joists and a subfloor of creosoted lumber were then built on this foundation. Thus a permanent and lasting foundation of inexpensive materials has been provided for the finished maple floor.

Heating for the building is provided through the use of unit heaters placed at strategic locations along the two sides of the building from which warm air is blown into the playing arena, thus eliminating the conventional installation of an expensive cast-iron radiator heating system.

Philosophy Changes with Facilities

In its construction of a physical education plant such as I have described, Emory University has broken away from the philosophy and traditions of the past and has moved into a new era where its well-known physical education program, embodying the philosophy of "athletics for all," will provide an opportunity for every student to participate in all sports and to take all courses offered by the department. Thus the long shadows of tradition may be seen fading away in the twilight of a new era in gymnasium construction.

Emory University's physical education program of encouraging students to "play the game—not yell at it" as described by Professor Thomas E. "Tom" McDonough, Director of Physical Education, is as follows:

Emory is about to enter the third decade of its second century as an educational institution, and we do not feel that the University has ever suffered from the lack of the kind of publicity which big-time athletics gains for a school. As a matter of fact, Emory's Board of Trustees foresaw 57 years ago the difficulties which are now besetting schools with over-emphasized intercollegiate athletic systems.

In that year, the trustees called a halt to intercollegiate events "in view of the demoralizing influence of match games upon the habits of the students and the strong tendency to gambling which such games foster."

Emory's program, the oldest comprehensive collegiate intramural sports system in America, is concerned, therefore, with figuring out ways and means of getting the benefits of athletics spread out to as many of the students as possible, instead of limiting it to the semi-professional few.

Heart and soul of this program, administered by experts in physical education among whom advanced degrees are just as plentiful as bulging biceps, is the unique system of league organization and point awards which puts a premium on "getting into the game," whether it's football or horseshoes.

Student groups, including schools, classes, fraternities, etc., are split into leagues which go through regular play-offs to determine league and campus championships. The comprehensive point system, by which a group weak in one sport may recoup in another, prevents waning interest and tends to get all members into some form of competition for the benefit of the group's total score.

During 1946-1947, despite inadequate equipment and a war-dislocated student body, Emory fielded six completely-equipped football teams, 35 basketball teams, and held organized intramural, interfraternity, and interorganization competition in every popular major and minor sport.

In addition, varsity teams played regular intercollegiate schedules in golf, tennis, swimming and track—without benefit of any conference membership. Most successful aggregation last year was the swimming team, which produced 10 national and regional AAU championships and won seven dual meets out of eight, against top-flight competition.

The chief emphasis of the Emory system is on "carry-over" sports, the kind that may be played after a student leaves college. Golf, swimming, and tennis come in for a lot of attention.

After all, most of our boys will wind up as professional men—doctors, lawyers, dentists, preachers, engineers—and they won't be playing football or basketball on their afternoons off.

TORONTO BOARD OF EDUCATION PLANS AHEAD

By C. H. R. FULLER, Business Administrator

and C. E. C. DYSON, Chief Architect

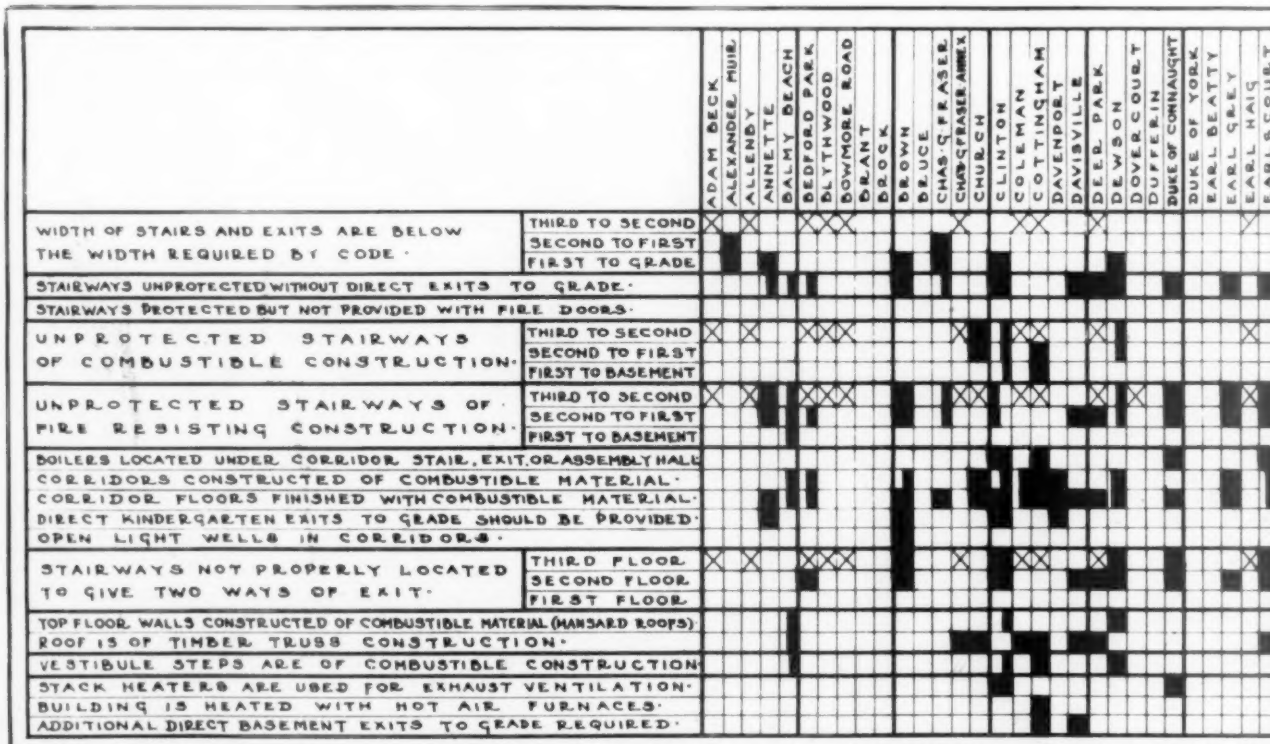
Toronto Board of Education

Mr. Fuller received the degree of Bachelor of Applied Science from the University of Toronto. Upon his return from overseas duty in World War I he became business manager of the board of education in Oshawa, Ontario, and in 1934 business administrator of the board of education in Toronto. He is 1948 president of School Business Officials.

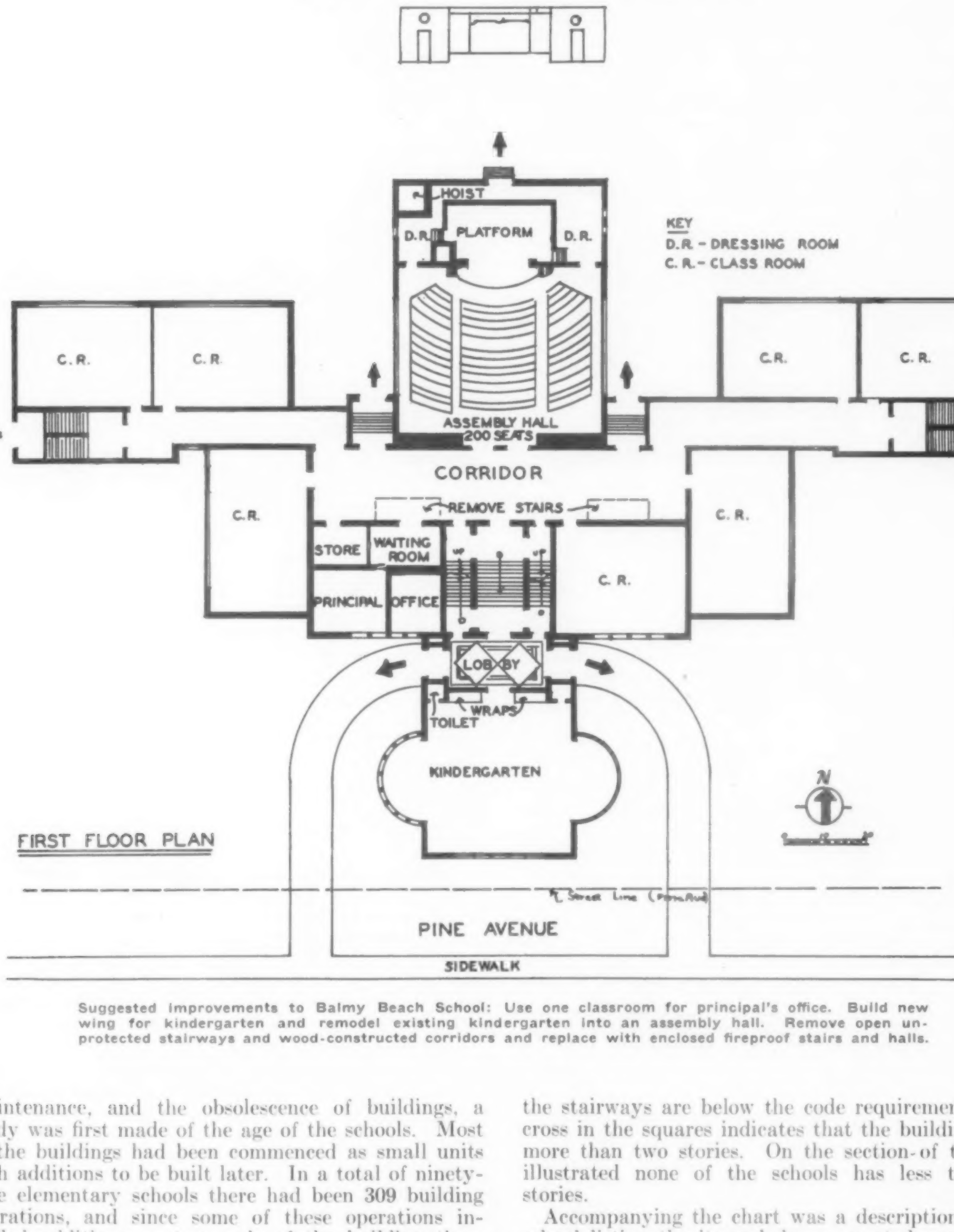
Mr. Dyson is an Englishman, receiving his architectural training at Durham University and the Leeds Institute in England. He has held the position of chief architect to the Toronto Board of Education for many years and is responsible for over 50 per cent of the present school accommodations in Toronto.

TORONTO, CANADA, has a school system with 127 school buildings. A number of these are fairly old, the oldest having been erected in 1874. During the recent war period a scheme was conceived on making a survey of the buildings with a view to setting up a plan for postwar reconstruction and rehabilitation. A previous survey had been made regarding fire doors, fire extinguishers and minor hazards, and this particular survey dealt with hazards of various descriptions which were consequent on the planning and construction of the buildings.

With age definitely affecting depreciation, cost of



· ANALYSIS OF TORONTO PUBLIC SCHOOL BUILDINGS ·
SHOWING IN WHAT RESPECTS THEY ARE BELOW ACCEPTED MODERN STANDARDS OF PLANNING AND CONSTRUCTION



Suggested improvements to Balmy Beach School: Use one classroom for principal's office. Build new wing for kindergarten and remodel existing kindergarten into an assembly hall. Remove open unprotected stairways and wood-constructed corridors and replace with enclosed fireproof stairs and halls.

maintenance, and the obsolescence of buildings, a study was first made of the age of the schools. Most of the buildings had been commenced as small units with additions to be built later. In a total of ninety-nine elementary schools there had been **309** building operations, and since some of these operations included additions on two ends of the building there were **492** units in the **99** buildings. These were tabulated as follows:

A chart was prepared which shows at a glance where any building is not up to present day standards of safety. The accompanying illustration shows the form of the chart.

Our building code today requires that provision of three feet width per hundred persons be provided in stairways and exits. By referring to the chart it will be noted that it indicates by black square where the stairways are below the code requirements. The cross in the squares indicates that the building is not more than two stories. On the section of the chart illustrated none of the schools has less than two stories.

Accompanying the chart was a description of each school listing the items below present day standards and also giving a list of recommendations for rehabilitation work or, as in several cases, a recommendation for partial or total reconstruction.

The following is a sample of these descriptions and recommendation:

Balmy Beach School

The original unit of this building was erected in **1906**. Subsequent additions were made in **1911, 1914, 1921, 1928, 1929**. An outside toilet room was con-

structed in 1920. It is a two story and basement structure, but there are two classrooms in a third story. Part of the roof construction is of wood with sloping slated roof.

The building is below the standards now required by the Toronto building code in the following particulars:

(a) The older part of the corridor construction and finish is of combustible material.

(b) There are three stairways in the building. The east and west stairs from basement to second floor are of fire resistant material in fire resistant enclosures, but the center stair from basement to third floor, while of iron construction, is not in an enclosure and does not have an exit at the bottom direct to the grade.

(c) The two rooms on the third floor are served by the center open stair and there is an iron fire escape.

(d) The walls of the corridor serving the two rooms on third floor are of frame and plaster construction.

Recommendations

1. That the center bay of the 1906 unit be wrecked or remodeled and the open stair and wood corridor construction be removed and replaced with modern stair in fire resistant enclosure.
2. That the necessary administration offices and teachers' rooms be included in the reconstruction.
3. That the east and west stairs be continued up to the third floor with connecting corridors and that the fire escape be removed.

The next step was to prepare sketch plans and in doing this the academic requirements were also studied. In the school described it was noted that the kindergarten is on the north side, and since an assembly room was requested, the sketch proposes that the existing kindergarten be remodeled into an assembly room with platform added and that a new kindergarten be built.

Sketch plan of this school is illustrated.

Similar procedure was adopted with all schools and careful study made as to whether it would be economical to rehabilitate the building or provide for a complete new building. Appropriations under capital expenditure for building have already been approved to the extent of $3,286,000 and in addition some of the rehabilitation work is being done under current expenditure.

Many of the buildings were found to meet all safety requirements of present day practice and our building code, and these are being studied with a view to bringing them up to date in regard to daylighting and other academic requirements. We have already removed the old type windows in some classrooms and introduced directional glass blocks in the upper part with clear vision strip in the lower part. This gives a better and more even diffusion of daylight and in rooms with southern fenestration, it eliminates the problem of window shade obstruction of sunlight. We are using delicate pastel colors in decorating. The reflecting values of the colors are from 65 to 72 per cent for wall and for ceilings 85 per cent. With the use of glass blocks we now get a real value in light distribution.

Community use of the schools also receives consideration in our postwar projects and auditoriums and gymnasiums are being added where there is need. Increased facilities for craftwork are being arranged, primarily for school needs and secondarily for community use.

Recently the Federal Government at Ottawa announced the placing of controls on all building construction. Every construction project in Canada will have to get Ottawa approval before it can be started; also, imports into Canada of wide classes of machinery and structural steel will be allowed only by government permit. It was stated that much of the current investment for commercial, office service and amusement purposes must be deferred.

Just what these regulations are going to do to the very large proposals for new construction in schools in Canada is not yet clear. We have asked that schools be exempted or given priority. Canada is experiencing an unparalleled investment boom, Ottawa says. Expenditures on new construction, machinery and equipment were estimated at $1,800,000,000 in 1947, and substantially more in 1948. This is fundamentally encouraging, but it involves unprecedented imports of United States goods. On the average, every dollar spent on construction and machinery involved some 30 cents in U. S. exchange.

The reason for applying selectivity in the current construction expansion is the need of saving United States dollars now and providing more United States dollars in Canada in the future. The government in Canada is seeking to rebuild its exchange resources by increasing Canada's productivity.

It will be interesting to watch what the effect of this policy will have on school construction in Canada and especially on our own program here in Toronto.

COOPERATIVE PLANNING IN THE SCHOOL BUILDING PROGRAM

By WILLIAM S. BRISCOE

Assistant Superintendent of Schools, Oakland, California

As Assistant Superintendent of Schools Mr. Briscoe is responsible for Oakland's school building program. He is a graduate of Stanford University and the University of California. During World War II he served as Lieutenant Colonel in charge of Educational Reconditioning in the Office of the Surgeon General. Prior to his present position Mr. Briscoe was in charge of elementary and junior high schools in Oakland. He has also been associated with several firms as construction superintendent.

IN 1944 Oakland's Mayor appointed a Post War Planning Committee. After study of its job this committee proposed:

"To develop comprehensive plans for the orderly development of all of Oakland's resources, public and private;
"To expand and develop opportunities for cultural and educational advancement and the spiritual welfare of our people; and
"To solicit the cooperation of all organizations and every individual citizen in carrying out the program which this committee will formulate."

The committee's statement of public needs amounted to the astonishing sum of $181,000,000—fifty-nine per cent of the total assessed valuation of the city.

Obviously no such outlay of funds was immediately possible. Therefore, the various needs were re-studied and weighed as to their relative importance. The result was a financial program which it was believed could be financed within the limits of a 60 to 65 mill tax rate. The schools' share of the bonds which it was agreed would be floated was $15,432,000. On October 23, 1945 the citizens of Oakland passed this issue by a vote of more than eight to one.

School authorities and members of the Post War Planning Committee knew that the amount of the school bond issue was not enough to meet all of Oakland's school housing needs, but they believed most of the major building problems could be met. The rest, it was felt, could be provided on a pay-as-you-go basis. Everyone was happy with the solution. Then came the rude awakening. First it was discovered that practically all of the studies of needs made prior to 1941 were invalidated by the war. The thousands of persons who had come to work in the shipyards did not go back home again. In addition, thousands of service men who had been stationed in California on their way to the Pacific War returned to establish homes. Just how far wrong prewar guesses were, is evidenced by the estimates of engineers and statisticians who predicted the San Francisco Bay Bridge would serve adequately all traffic needs until 1970. It was swamped with traffic in 1946. The population of Oakland increased from 302,000 in 1940 to 401,000 in 1945 and to an estimated 425,000 in 1947, an increase of 37 per cent since 1940. In the same period school population increased from 43,100 to 45,300, only a 5 per cent increase to be sure, but, if the children now under five years of age remain to attend school in Oakland, the school population will reach 64,900 by 1953-54 and 67,700 by 1960, a 50 per cent increase by 1954 and over 57 per cent by 1960. The birth rate has almost doubled since 1940.

To all of these perplexities has been added inflation which has sent building costs skyrocketing from $6.50 a square foot in 1939-40 to $13.50 a square foot in 1947 and taxes from $5.09 to $7.24 per $100 of assessed valuation. Conservatively estimated, Oakland's school building needs by 1960 will run in excess of $45,000,000. While present unused bonding capacity is $11,580,000, needs by 1957 will exceed this by $8,000,000. Mounting costs make a pay-as-you-go plan impossible. As outstanding bonds are retired, it will, therefore, be necessary to vote two additional bond issues, one not later than 1951 and the second not later than 1957.

Oakland's problem, therefore, is one of constructing a master plan covering a period of approximately fifteen years and of spending the bond money now available on key solutions of such a plan in order to meet both present and future needs. There is the further task of informing the people of Oakland's present and future school needs and of preparing them to accept the idea that additional bonds must be voted at approximately the times indicated. The problem is especially difficult because citizens had expected to get more school facilities from the 1945 Bond Issue than they will, and they are sensitive to increased taxes and to high prices. The remainder of this paper will be devoted to discussing plans and progress toward the solution of this problem.

The first attack on the problem was to propose a number of principles basic to the conduct of the building program. The Board of Education, after discussing these, directed that in conformity with the objectives of the Post War Planning Committee the school building program (a) should be developed as a part of a Master Plan for the City of Oakland "for the orderly development of all Oakland's resources public and private"; (b) should aid in expanding and developing "opportunities for cultural and educational advancement and the spiritual welfare of our people"; and (c) should be designed "to solicit the cooperation of all organizations and every individual citizen in carrying out the program."

The Board, also advised of the fact that the amount of money available was not enough to meet all of the needs of the schools, adopted the following principles and procedures to be followed in the expenditure of building funds available:

1. "Priority as to order of building will be determined on the basis of weighted estimates as to educational, health and safety needs.
2. "A plan for expenditure of building funds will be established, based on the above principle, and will be adhered to throughout the building program.
3. "In matters requiring decision as to whether an expenditure is justified or not, educational values will be given more weight than other factors.
4. "Partial solutions to building and site problems which fail to provide facilities to carry out a standard educational program, or which are not a logical part of an ultimate solution which will be completely satisfactory will be avoided."

Having approved the above principles, the Board has followed them as guides to its own actions with the result that decisions have been consistently sound and public relations uniformly good. These principles have been a great help in withstanding community pressures.

Organization of the Program

After approval of basic policies by the Board the next step was to effect an organization to carry out such policies. A directive entitled "Organization and Procedure for Conducting the 1945 Building Program of the Oakland Public Schools" was prepared and presented to the Board for approval. The main feature of this directive was the description in detail of the functions of the various persons and groups responsible for conduct of the building program, including those of the Board itself. The Board by adopting the directive organized itself into a Committee of the Whole. This committee reserves every Tuesday for the purpose of giving thorough and full consideration to policies, decisions, and other matters requiring action of the Board of Education in connection with the Building Program. At this meeting individual citizens or citizen groups may appear by invitation to discuss the problems of their respective schools.

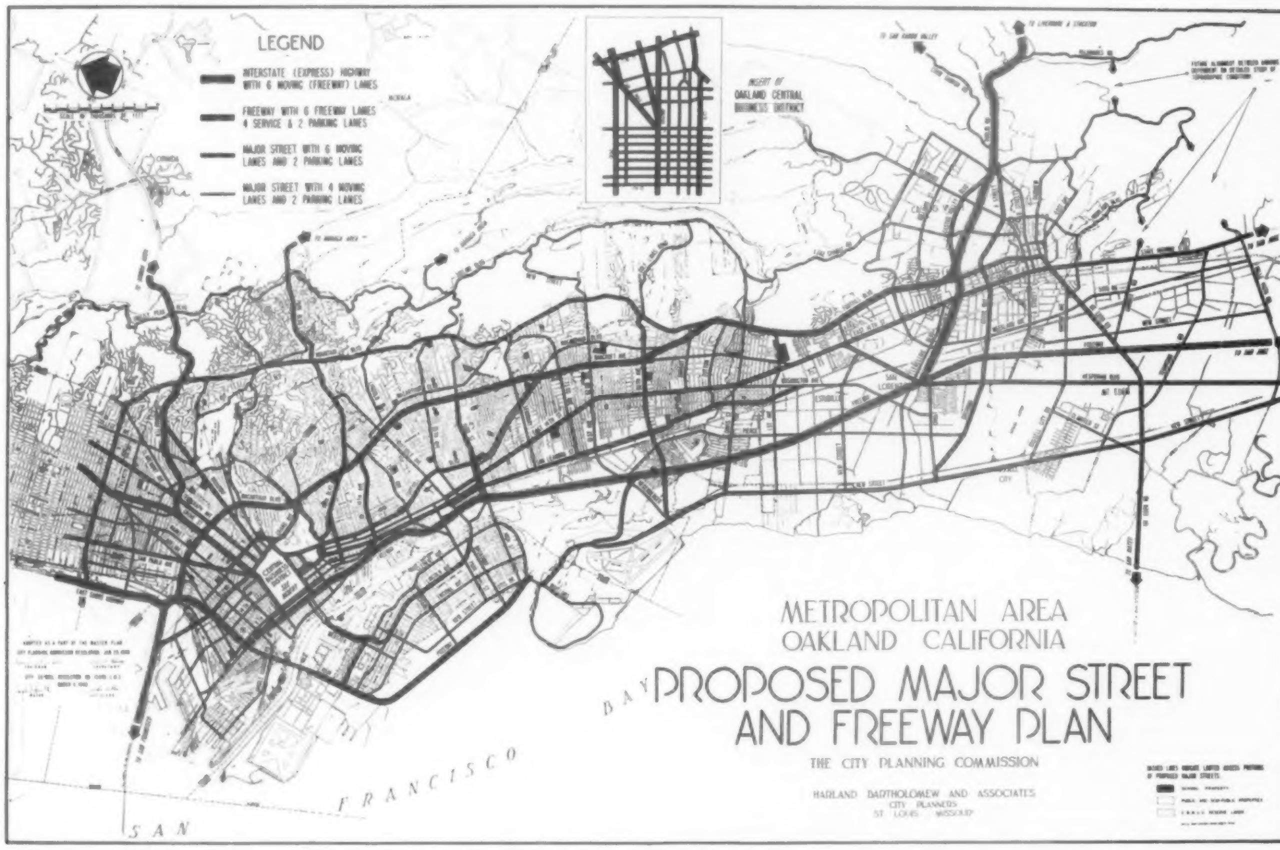
The Superintendent of Schools is responsible directly to the Committee of the Whole for the Building Program. He in turn is assisted by two officers, the Assistant Superintendent in Charge of Planning and the Business Manager, who meet with the Committee of the Whole as aides to the Superintendent. There is also a Superintendent's Cabinet composed of the Assistant Superintendents and Business Manager which acts in an advisory capacity to the Superintendent on all matters of primary concern. The Assistant Superintendent assigned to the building program is responsible for planning including research to establish location, size and educational design of buildings, selection of sites, standards of educational equipment, and for staff and public relations in connection with the building program. In addition he participates in financial planning, being responsible for seeing that recommendations are within the budget. He is assisted by a Research Staff and a School Advisory Committee composed of teachers and principals who advise on educational standards. Other assistants are available as needed for special problems. The Business Manager is responsible for the procurement and development of sites and the production of the buildings in line with educational requirements and specifications prepared by the Assistant Superintendent and approved by the Superintendent and the Board of Education. Responsible to the Business Manager is the Chief of the Engineering and Architectural Department and the Land Agent. In order to facilitate planning, close and effective liaison has been established between the Assistant Superintendent in Charge of Planning, the Chief Engineer and Architect, and the Land Agent, who work as a team.

City Planning and School Planning

To facilitate the planning of schools as part of a Master Plan for the Citly of Oakland as envisioned by the Post War Planning Committee, the Board of Education has encouraged the school staff to participate in various community planning activities. The Superintendent in Charge of Schools is a leading figure in the Post War Planning Committee. The Assistant Superintendent in Charge of Planning is an associate member of the City Planning Commission, of the Streets and Highways Committee, and of various civic planning groups, as is the Business Manager. The City Planning Engineer, the Director of Recreation for the City, the Director of Parks and the Assistant Superintendent of Schools in charge of school building planning confer on all matters of mutual concern.

In order to comply with the objective of the Post War Planning Committee—that every citizen and all organizations should have opportunity to cooperate "in carrying out the program"—a plan of cooperative research and planning was devised. The following points cover the main features of the plan:

1. The city was divided into areas of similar socio-economic and geographic description for purposes of study.
2. School principals in each of these areas were organized into committees to assist in the study of the school needs in their districts in relation to the school needs for the city as a whole.
3. Key-citizens in each of the areas were organized to study the needs of their own districts in relation to the city's total school problem.
4. To each organized group the Assistant Superintendent in charge of the building program and his research assistants presented a composite picture of the facts and problems which such organized groups had helped to develop.
5. Possible solutions were discussed and a Master School Plan for the city was developed which listed key solutions and the order in which they should be attacked.
6. Finally a city-wide group representing each sub-area was organized to discuss major plans and policies with a view to relating the schools' master plan to the Master Plan for the city and to develop a plan for financing needs.



Application of Research Techniques

Population studies which have been made offer a good example of how a plan of cooperative research can operate. In making population studies to determine the sizes and locations of schools it is necessary to gather all of the pertinent facts and data. In addition to the usual sources of information, such as census surveys, utility surveys, and the like, the Oakland Public Schools have had each principal, in cooperation with the central office, survey his school district. In this he has been aided by his Parent-Teacher Association, Dads' Club, and other community groups. A check sheet for the use of the principal and the central office has been prepared covering four major topics under which have been listed thirty-five separate questions. These major topics are:

1. What are the natural school boundaries of the district?
2. What are the statistics bearing upon population predictions?
3. What are the social factors affecting this school?
4. What are the possible solutions to the housing problem?

Each principal and his faculty, together with members of his community, have given serious thought to these problems. In this they have been aided by the central office, which, itself, has made independent studies of each district within the city as well as of the city as a whole. The studies by principals and by the central office have checked and supplemented each other. One interesting technique developed in these studies by principals has been the establishing of natural boundaries for schools based on walking time rather than distance. With rate of walking adjusted to that of primary children each elementary school principal has measured distances by stop watch in terms of walking time marking points on a map in various directions from the school which a child would normally reach in five minutes, ten minutes, fifteen minutes, and so on. By connecting these points one establishes an enclosing line like a contour line which shows walking time. This walking-time line is influenced by topography, street conformation and traffic obstacles. It is a very practical and useful tool in determining school zones and was used with great success in deciding which sections of a school area would be served by school bus and which might be expected to use public transportation.

In addition to the study of each individual school by the principal, faculty, and his community, the city has been divided into eight larger areas which have been found to be of similar social, economic, and geographical description. The principals of the various schools in each of these areas have been organized into study groups, one for each such area, for the purpose of studying the school needs of the city and of their areas in particular. Complementing such principals groups are citizens' groups for each such area. Both the principals' and citizens' groups have spent many hours at the central research laboratory becoming acquainted with the facts and studying possible solutions to problems. Outside the fact that a number of intelligent solutions have been reached by this method, the community has been made aware of the various problems of the schools and a more cooperative spirit has developed. The estimates arrived at by this cooperative plan promise to be more accurate than they

would otherwise be; but even though such estimates should not prove to be more accurate, the conclusions which have been arrived at are likely to receive more general support, and, if later are found in error, such mistakes are shared by the group, which is an obvious advantage.

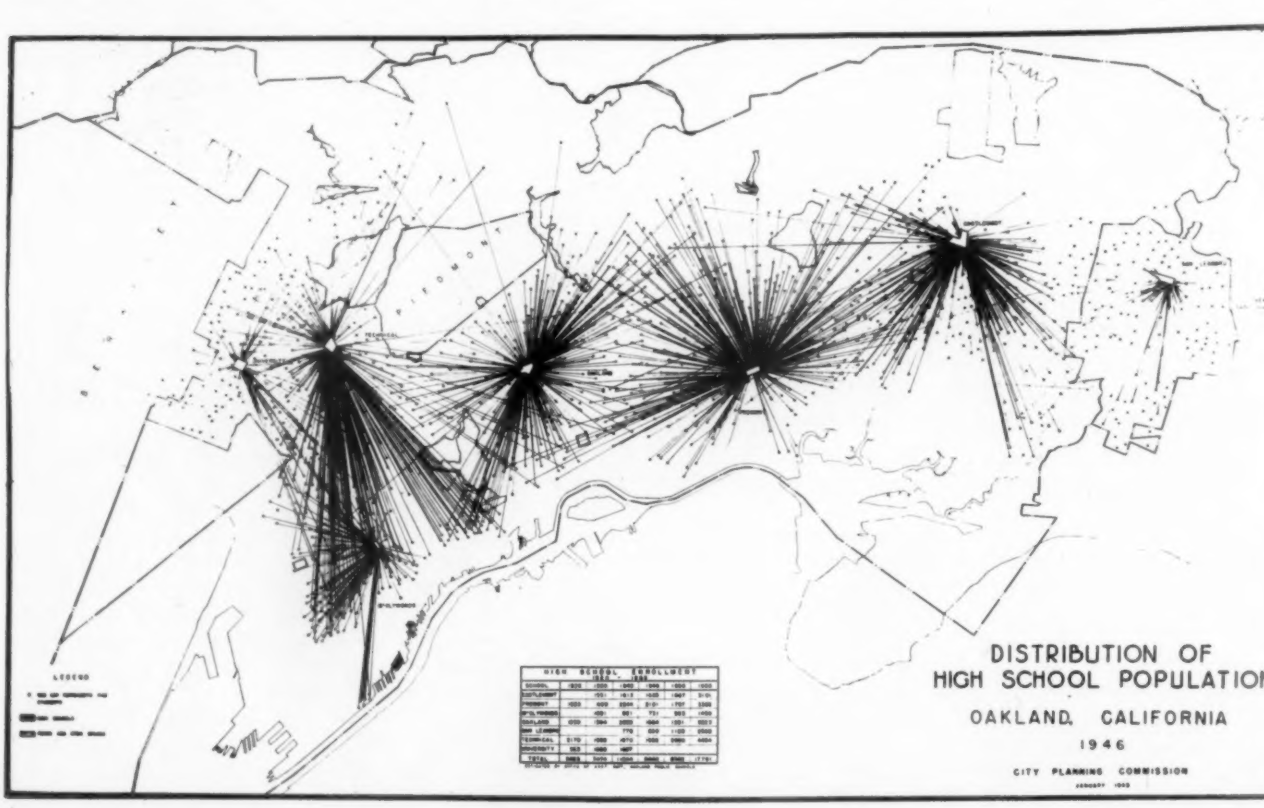
Methods Employed in Population Studies

In presenting data to groups it is advisable to bring all of the varied facts and information together into a form which facilitates the making of comparisons. Graphic representation of working data is desirable. Such technique is also valuable for the research worker himself. This has been accomplished effectively by using ozalid film on standard maps showing basic data. Six basic maps of the city, 800 feet to the inch, have been prepared. These are: a *transportation map* showing all present and projected public transportation facilities; a *zoning map* showing the purposes for which property has been zoned; a *land utilization map* showing all of the uses to which the various parcels of property throughout the city are devoted; a *map of streets*—of present and projected streets and highways—marked so as to distinguish main arterials, freeways, and primary surfaced streets; a map showing the *census tracts* within the city on which are placed the acreage and the 1930, 1940 and 1945 census figures for each census tract; and a map showing the *multiple versus single family dwellings within the city.* (This map is posted monthly.)

On ozalid film pinned over the various areas of the city, spot maps have been made for each elementary, junior high, and senior high school, and for each specific area under study. Since ozalid is transparent, but takes ink readily and can be marked with pencil and erased easily, it serves admirably for spot map studies. For example, if a particular school or area is under consideration, by pinning the ozalid spot map over any one of the six maps mentioned above, or over several of them in succession, any or all of the six factors can be studied in relation to the distribution of school population of the district under consideration. Since it is possible also to see spots clearly through several thicknesses of ozalid, any desired map to show various factors can be made very quickly by mimeoscope technique.

Several methods of arriving at predictions of population have been employed. One of them was based on a study of land utilization. This method requires the counting of the number of homes in each area within the city. An estimate is made of the probable future homes based upon the number of suitable vacant lots which have also been determined by count. The average number of children per dwelling unit of various types is also determined for the district for a period of years. Percentages of children per house have been calculated for a ten-year period and for various types of housing. By multiplying the number of present and potential dwelling units by the percentage of children for such units, a saturation population is calculated. As minus factors, the per cent of parochial school attendance, the effect of the encroachment of business and industrial areas and of social cleavage, and the effect of the location of other schools are taken into account. By such technique a beginning point of the curve of population growth and an end point are established. The slope of the curve in between has to be estimated by other means.

A simple and effective way of doing this and also of determining school population growth in general, is



by the method of projection forward of the school population by percentages which have been found to apply from grade to grade. For example, in order to determine the next year's 12th grade class, one multiplies the number of children in the present 11th grade by the average percentage of other 12th grade enrollments in relation to their preceding 11th grades. The same technique is applied to each grade successively down to the first grade. By collecting figures on births and correcting them for residence of parents, one can estimate what percentage of the children born five years earlier may be expected to enter the first grade. By using this percentage progression technique a simple progression table can be prepared which will predict total school population for five years without guessing as to birth rate. The method is very useful in forecasting population of particular school areas, because births can be spotted year by year on ozalid film for each school and an actual spot map projection of the first grade five years later can be made.

The percentage-progression technique is an easy way of taking account of birth rate, death rate, and in and out migration. Percentages of progression from grade to grade for twenty-three years have been studied in Oakland for each school, for each of the eight larger school areas, and for the city as a whole. There is positive correlation between the progression percentage and the percentage the district has attained of its saturation point in building. However an inverse ratio obtains in the older districts since oftentimes young parents living in apartments or flats move to outlying areas when the children are ready for school. Study of the curve of percentages of progression for schools located in such districts reveal this fact. If one projected forward the children under five without considering this factor he would greatly over-estimate the future population of the school in question.

Review of past experience offers another technique for guiding one's judgment in estimating future school population. Curves of school population growth for each school since its founding, together with curves for total elementary, junior high, and senior high populations have been found helpful in judging the future growth of schools and of areas. Supplementing such data are comparisons of the population growth of Oakland with that of the county, state, Pacific Coast, and nation. Also, studies as to population and births and birthrate as compared with building permits, acreage, and vacant lots for each census tract, for each of the eight larger school areas, and for the city have been found useful.

The data assembled in Oakland concerning its school population growth reveal twenty to twenty-five year cycles in the up and down swings in rate of school population increase. At the present time there are a large number of young children in the primary grades, a large number of children under school age, and a high birth rate. Twenty-five years ago the same phenomenon occurred. Today, partially as a result of delayed marriages because of the war and also because there are more young adults as a result of a boom in births during and immediately following the First World War, more children are being born. One may expect, therefore, that a wave of population will go through the schools followed by a decline in school population, succeeded again by another wave of population in the late 60's and early 70's.

The final method employed in predicting school population in any case is the exercise of personal judgment—personal judgment based upon facts and information, however. Many of the factors influencing the growth of school population within a city are psychological. What any city is to become is in the minds and spirit of its people. If they are energetic and enterprising, the city may grow. The nature of the city, particularly the source of its income and the interests of those who control its business future, largely determines how rapidly and in what directions the city will develop.

It is necessary to assess these psychological factors. It is imperative that the plans of all who are helping to build the city be known. Therefore, in the planning of the school program it has been found advisable to cooperate with the Oakland City Planning Commission and with groups of business and industrial leaders in the development of a Master Plan for the city, of which the schools' program is one part. Thus data and conclusions arrived at by processes described above are further checked by the business, industrial, and professional leaders of the city whose business it is to know where future developments of the city are likely to take place.

Developing Building Standards

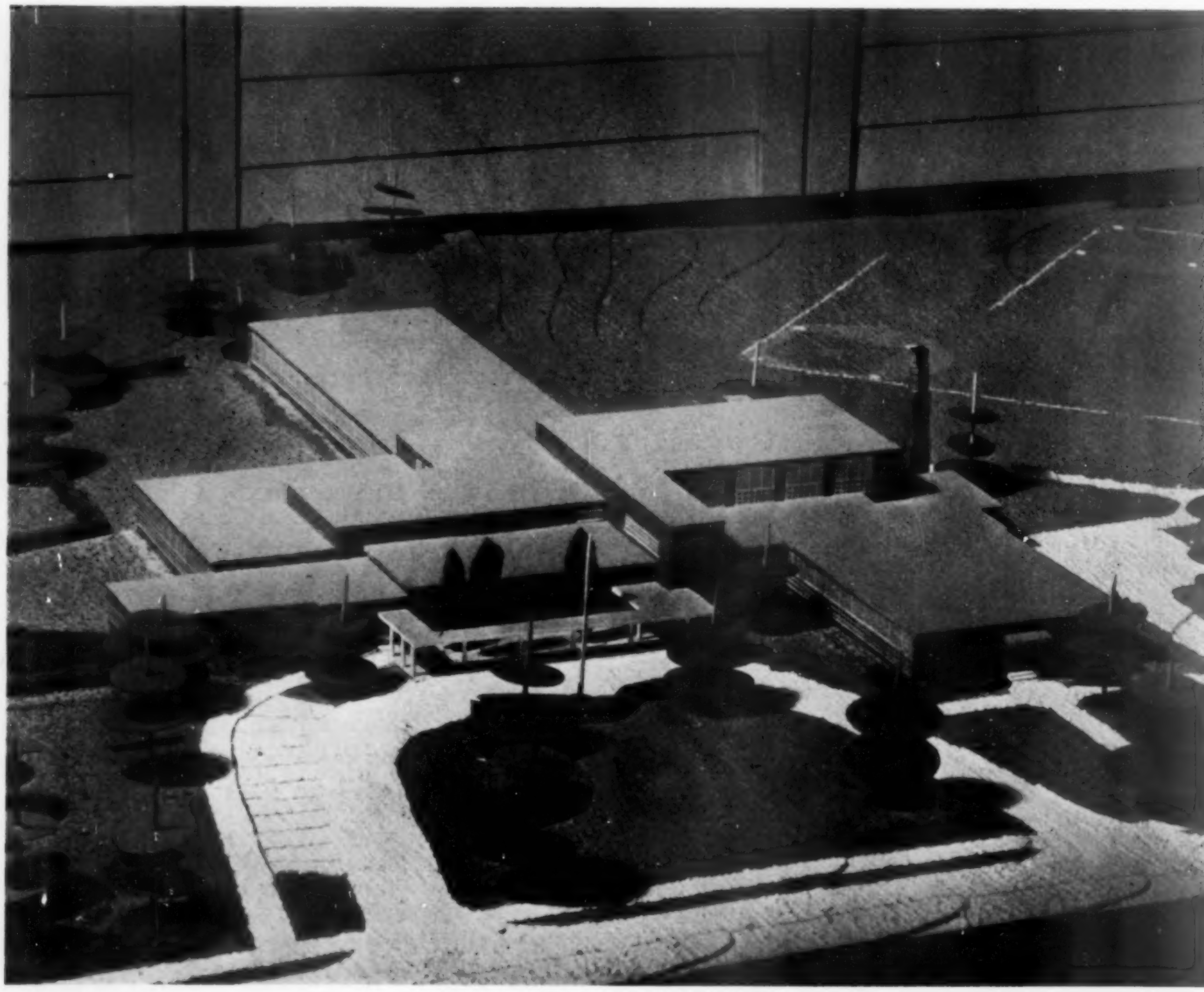
Oakland has followed the rather common practice of having committees of teachers, principals and supervisors assist in preparing building design standards. Committees were aided by research assistants and by members of the architectural engineering staff under the direction of the Assistant Superintendent in charge of building planning. In one respect, however, Oakland's planning is believed to be unique. Ideas of committees were included in actual classroom design, tried out in use, and perfected. Actual experiment with design has proved of such worth that henceforth such will be standard practice. Experimental construction has not only improved educational and architectural design, but has made for economy, as many ideas thought desirable were not found practical in use.

Oakland's schoolhousing problems, though difficult are no doubt typical of those of hundreds of communities. The solution, it is believed, is to be found in the sharing of responsibility and of planning with the people. Complete and utter frankness must prevail. There is already much evidence that such method is effective. One example will suffice. Recently a meeting was held in an outlying community to explain Oakland's Master Plan and specific plans for the particular community which is a separate city included in the Oakland High School District. Plans proposed were for half what the community had expected. At the end of the presentation the leader of the opposition asked, "I suppose you want to know what we think about this?"

"Yes," was the doubtful reply.

"It's the first time in twenty years I've ever agreed with the Oakland Board of Education on anything. I move endorsement of the plans."

The plans were unanimously approved.



Thomas Jefferson Elementary School

DESIGNS FOR TWO PROPOSED GRADE SCHOOLS

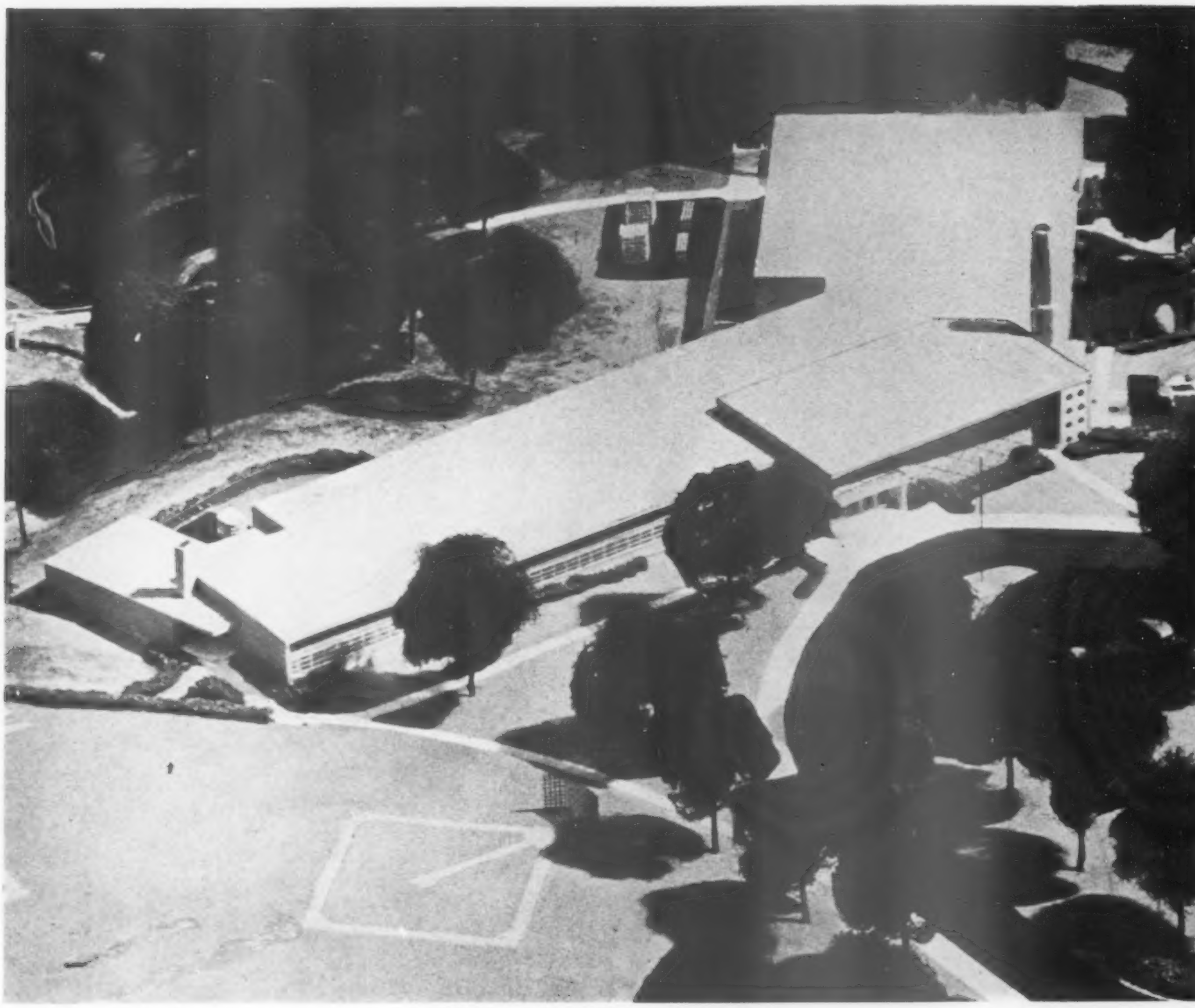
By CARTER E. HEWITT A.I.A.
Architect

and

JOHN D. SCRUGGS, A.S.L.A.
Landscape Architect, Peoria, Illinois

IN FORMULATING Peoria's postwar school building program Melvin G. Davis, Superintendent for District 150, laid down certain far-sighted fundamental principles which form the basis for the designs submitted.

The first of these principles was the retention of complete professional services including those of an architect, a mechanical engineer, and trained landscape architects engaged at the beginning of the projects to insure complete collaboration in such matters as the relation between elements of the buildings and outdoor recreational facilities. While it fell to the lot of the architect to coordinate the various technical services involved, there has been at all times a free and independent exchange of ideas with the constant aim of producing a harmonious and effective whole.



Reservoir Heights Elementary School

Mr. Hewitt is a graduate of Princeton, having received A.B. and M.F.A. degrees there. He entered private practice in architecture in Peoria in 1935 which was interrupted for 2½ years while he served in the Corps of Engineers during World War II in the Pacific.

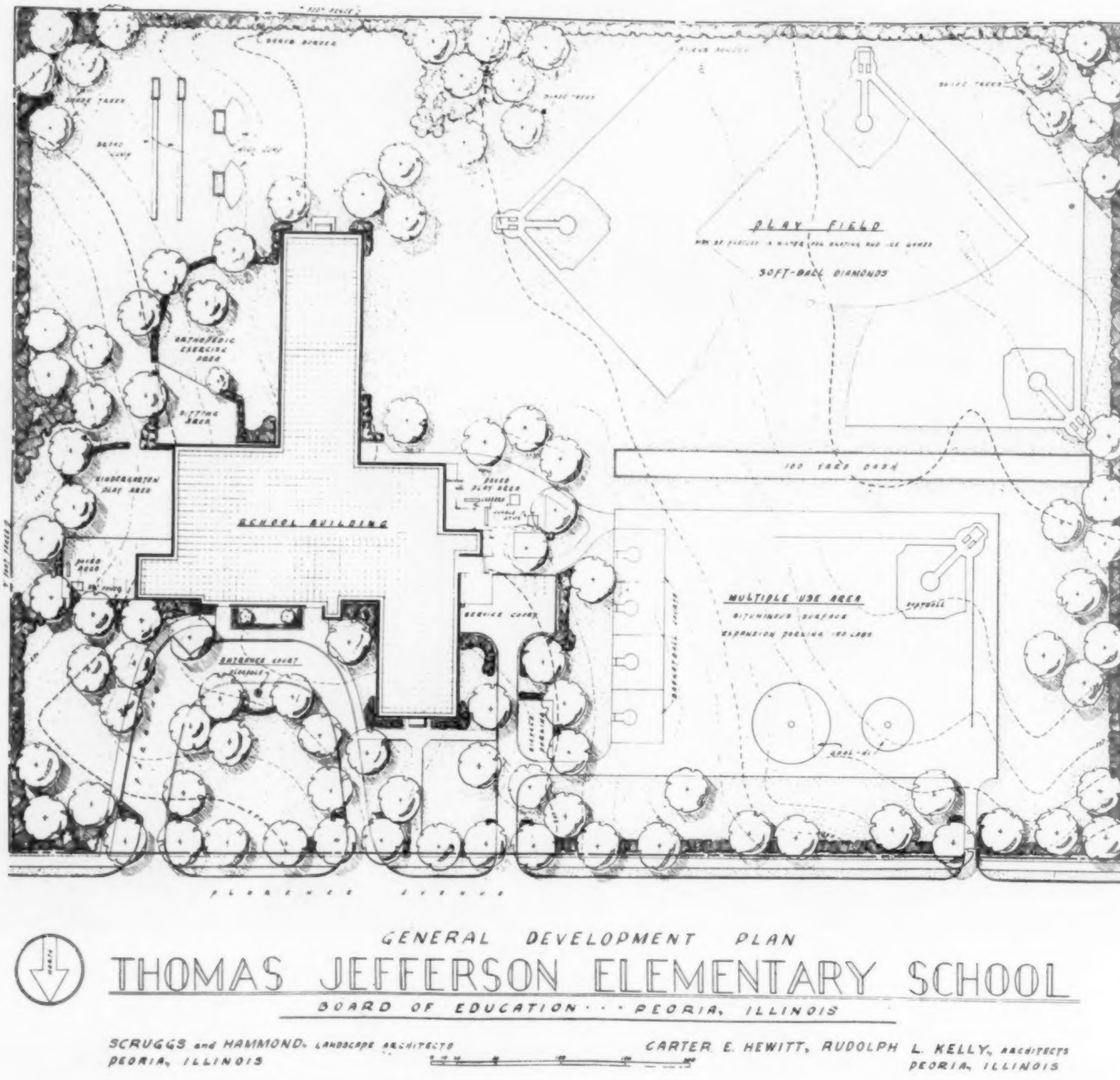
After working with several architectural firms, Mr. Scruggs entered independent practice in Peoria, Illinois. His projects include public and private schools, industrial plants, parks and residences, airports and housing projects, with emphasis on site and city planning.

The second principle laid down by Dr. Davis was that of careful consultation with teachers, principals, custodians, pupils and parents—those who will actually use and operate the completed properties. This procedure gave rise to lively discussions, but resulted in many improvements and a greater appreciation in all quarters of the problems involved.

The third principle was the acquisition of ample sites, carefully developed to provide optimum outdoor recreation facilities.

How Sites Were Determined

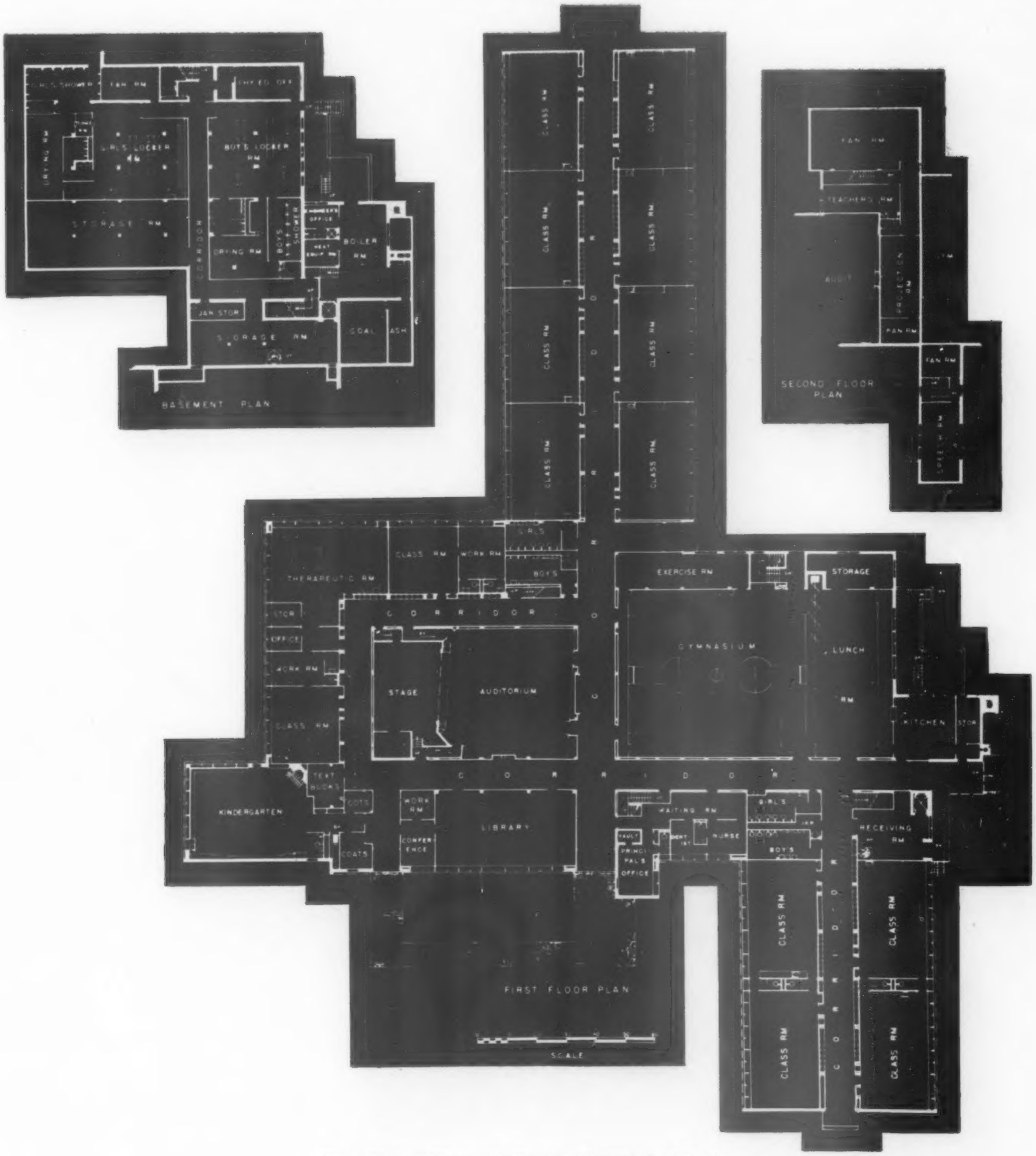
In the case of the Reservoir School, the only adequate open land within the area served was a rough, heavily wooded tract owned by the water company. The site comprises 9.3 acres and contains a difference



of elevation of 72 feet. Both building design and disposition of outdoor area were strongly influenced by these facts. Extreme care was used in designing the grading to avoid unnecessary loss of fine trees.

The location of the building was given very careful study. Its final location was one which allowed the larger, relatively flat areas to be used for outdoor play facilities, and at the same time provided the most desirable and generally efficient arrangement of entrance and service roads, courts and parking areas, classroom orientation, and related items. In the interests of safety, quiet, and general appearance the entrance road is taken from a side street rather than from the heavily traveled state highway. Both the state highway and the city streets at this point are in the planning stage; the city engineer and the state highway engineers provided excellent collaboration on alignment and proposed grades.

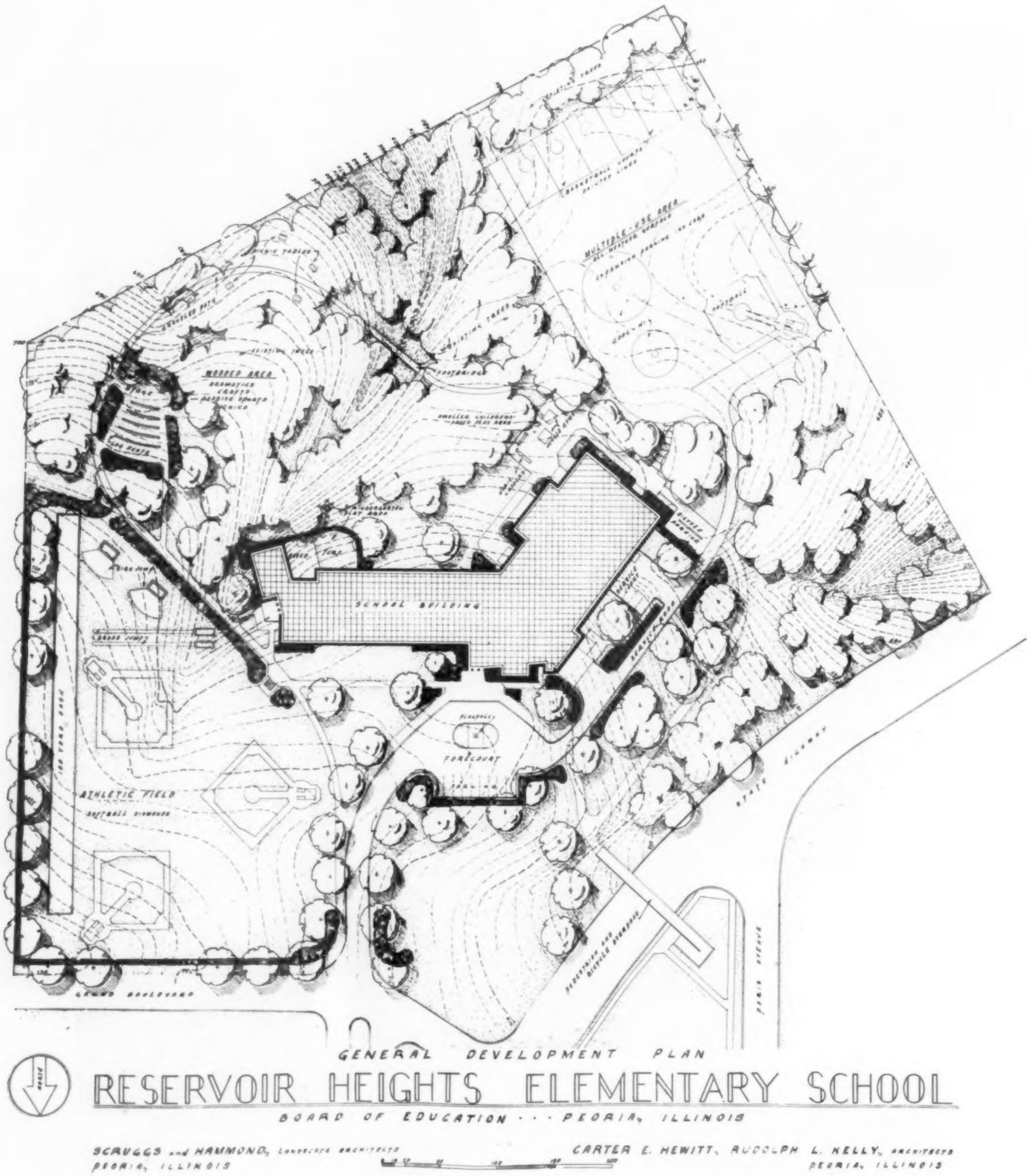
In order to protect children arriving on foot or by bicycle the state highway department has agreed to furnish a pedestrian and bicycle overpass with ramps, located at the intersection of an important side street with the state highway. An overpass was chosen in preference to an underpass, for reasons of topography, cleanliness, morality and ease of access. The large wooded area is to remain as nearly as possible in its



Floor Plan of Thomas Jefferson Elementary School

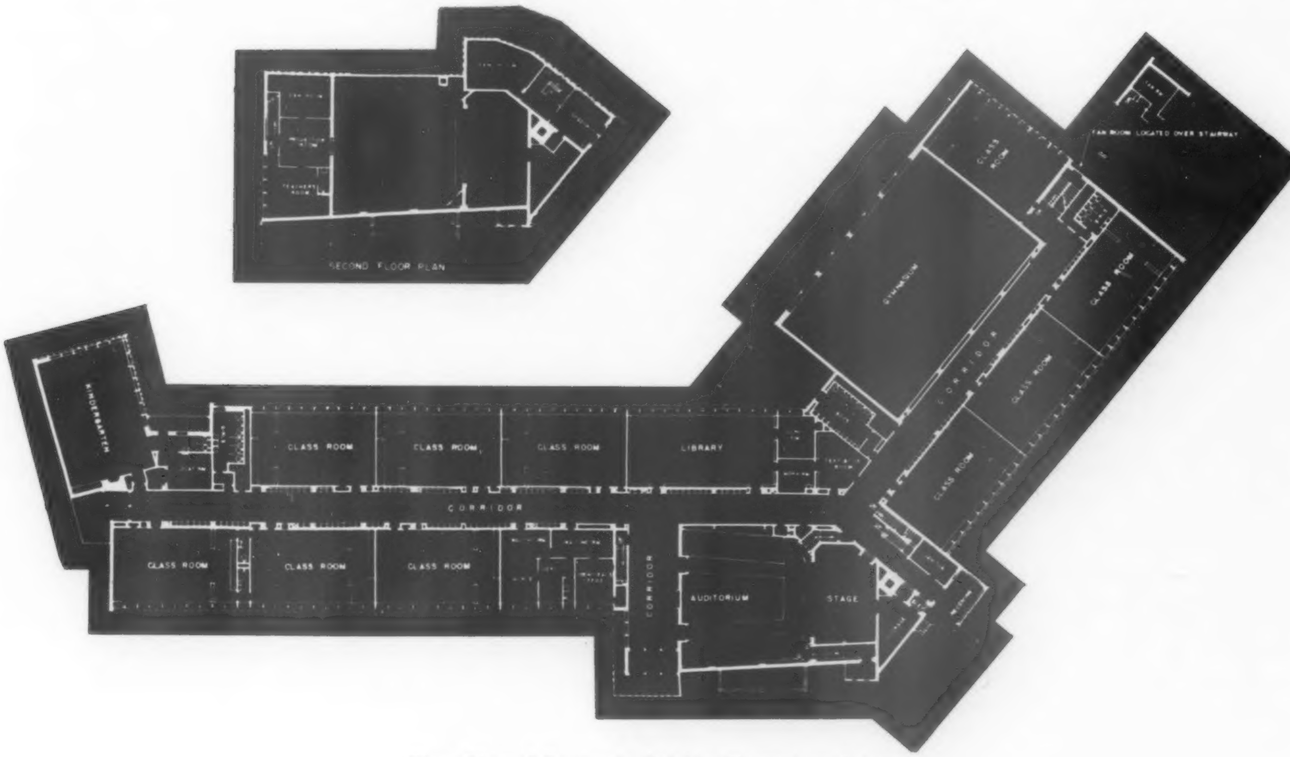
natural state. A gravel path, footbridge across the ravine, and picnic tables are to be added. A woodland theater is located where the natural slope forms a suitable seating area, and may be used for handicrafts, theatricals, or outdoor classes.

The final site for the Thomas Jefferson School presented fewer problems. However, it was thought necessary to acquire a site different from that originally purchased by an earlier board. The original site, small in the beginning, was further reduced by an easement for a new highway, and finally was rejected as a suitable location. The present site is



reasonably level and comprises 12.5 acres. It has no trees. In choosing the present site, Dr. Davis and the board sought to remove the school from main traveled highways, seeking an atmosphere of safety and quiet for the children.

For both schools an effort was made to keep the circulation system in scale with the uses required of it. The entrance road is wide enough to permit passing, while the service road narrows to a single lane. Parking for teachers is provided in the forecourt, and sev-



Floor Plan of Reservoir Heights Elementary School

eral spaces for maintenance personnel are furnished in the service courts. A wide pavement is provided for truck access to the coal bin and the unloading platform. Emergency automobile parking space is provided on the paved multiple-use play areas to be used for athletic or other events which may be open to the public. The pedestrian walks have been made eight feet wide to accommodate children moving along in groups.

Architectural Considerations

Dr. Davis next laid down the requirement of spaciousness. Classrooms were designed to permit as much activity as possible and a sink, work counter, and cabinets are provided in each classroom. The classrooms have dimensions of 23′x40′. Various arrangements for segregating activity space were considered, but the flexibility provided by one large room won the decision. Book cabinets provide a degree of separation, but these are mounted on large rubber-tired casters so as to be easily movable. Space is also provided for movable project trucks aligned when not in use with the work counter in each classroom. Seating is to be movable and the cabinets in each classroom are interchangeable, required heights being obtained by varying the base height.

The natural lighting of classrooms was the special concern of the architects and the superintendent. Rejecting various bilateral lighting schemes as either unduly expensive, hazardous from the point of view of maintenance, or otherwise undesirable, they selected directional type glass block panels extending continuously along one side of each classroom above the level of a continuous strip of clear glass windows. The construction follows closely the results of research by Dr. Harmon of Texas, and the Owens-Illinois Glass Company.

Visual education will be carried on in each classroom by means of portable projection and sound equipment, and therefore lined draperies operating on built-in curtain tracks are provided for darkening the rooms. These draperies will also add a note of homelike cheerfulness and color to the rooms which was especially welcomed, since for proper light reflective values, color on the walls of the rooms must be restricted to extremely light shades.

The schools also provide separate auditoriums seating about 200 children. These are equipped with stages, overhead projection booths, and provisions for projection from the rear main floor of the rooms. Floors are sloped to provide good sight lines. Seating is bench type, scaled for a sixth grade pupil. These rooms will serve moderate-sized community gatherings in the evenings. Large gatherings will use the gymnasiums.

The arrangement of the gymnasium in the Reservoir School provides for the use of the adjoining classroom as a stage to serve such larger gatherings, the stage consisting of a number of movable platforms for which special storage space is provided.

Provision for Flexibility

In the Thomas Jefferson School a further innovation is contemplated in that the lunchroom and gymnasium are separated by a large disappearing partition. This makes possible the erection of a portable

stage in the lunchroom area, and also a full-size basketball court for evening adult recreation, without unduly increasing the size of the plant. While the partition chosen has considerable sound-arresting properties, it is not contemplated that the result will be completely soundproof. However, the use of the two rooms is such that sound transfer is not a critical problem.

The principle of flexibility has been studied carefully in selecting the structural system for the school. It was found that a modular unit of 4 feet met requirements best. Stock modular size metal windows plus separating vertical T members fit exactly into this repeating unit, and so do standard size glass blocks. Light channel columns are introduced at 8 foot intervals for support. These columns are protected with vermiculite plaster for fireproofing, and are contained within the thickness of the double-shell metal-lath and plaster partitions. Each 4 foot modular bay is served with a flush-panel cast-iron radiator fitted under a wide marble sill. Piping for these radiators runs behind them, not below the floor, and is accessible through removable panels between radiators.

The system permits moving partitions between rooms 4 feet or multiples of 4 feet without disturbing structure or heating. Although the added expense of making the partitions themselves movable has been avoided, later changes can be made with a minimum of difficulty and expense.

In view of present high building costs and the difficulty of preparing dependable estimates, the general arrangements contemplate the possibility of omitting for the present certain portions of the designs. In the Reservoir School this objective is more limited than in the Thomas Jefferson School because of the unusual site conditions, but both schools are designed to include ample space for present requirements and provisions for further expansion.

Another principle laid down by Dr. Davis was provision for the school lunch program. Lunchrooms are sized to accommodate the entire school population in two sittings, and are served by completely equipped kitchens. Cafeteria service is not used for elementary schools, and school mothers assist greatly in preparation and service of food. For that reason both the mothers' club and the school dietitian were consulted before final kitchen layouts were determined. Food storage and garbage disposal were carefully considered and all spaces involved will be screened. The kitchens are so arranged that service to the main floor of the gymnasium is as direct as possible. All spaces involved have good natural lighting and the temptation to locate these important elements in a basement space has been avoided.

In the toilets both water closets and toilet partitions are suspended without floor supports, and floor drains are provided so that the floors may be sluiced down and mopped readily. Cross bars on which pupils might swing have been avoided. Walls and floors are of tile.

Physical Education Equipment

With a view to implementing the physical education program and adult recreation needs, complete locker and shower facilities for both sexes have been provided. The arrangements for handling athletic clothing are believed to be unique, and resulted from detailed discussions with the athletic director and the physical education director.

A system of basket storage was desired, but a separate room with a full-time attendant was impossible because of the administrative cost. The system had to be made workable when only one instructor (sometimes a woman) was present to operate it. And proper ventilation for basket storage was essential. Movable racks on casters for basket storage were considered, but rejected because of the degree of physical effort required and the cumbersome nature of the equipment.

The final solution is as follows: basket storage cabinets with cylinder-locked doors are provided in the center of the locker rooms. These cabinets have solid exterior metal doors, backs and sides, perforated shelves, and perforated tops. They are set over exhaust air plenums in the floor, so that all air from the room passes over the baskets and out. Behind each set of doors is space for forty baskets, enough for all the boys (or girls) of two rooms, this being the desired maximum size of a gym class. All of the baskets assigned to pupils in a given gym class are placed in the same compartment and when this class reports, only that section is opened. Thus thievery is impossible. Wall lockers without locks are provided for street clothes, and the room is locked when the class leaves for the gym. Showers are gang operated except for one shower which has separate control for use of the instructor. In the girls' shower one private cubicle with shower is provided for special use in case of deformity or other unusual condition requiring privacy. Shower heads are of the "prison" type to minimize meddling and breakage.

In developing the outside play areas the landscape architects worked very closely with the physical education director and athletic director. Requirements were similar for both schools. A large multiple-use area having a bituminous all weather surface was designed to permit large numbers of children to play a variety of games at the same time. Basketball half-courts are provided at one end backed by a high chain-link fence. Softball diamond, tennis, badminton, goal-hi, and circle games are also played in this area. All court lines are painted on the blacktop surface. As mentioned before, this large paved area provides extra parking space for 150 cars.

A smaller paved play area is furnished with horizontal ladders and jungle gyms. Play apparatus was limited to these items because it was felt that they are safe and require little in the way of maintenance.

The outside play areas for the kindergartens are half pavement and half grass. The paved section has a small jungle gym and several benches. It was requested that the outdoor area be at least equal to the indoor kindergarten space.

The orthopedic exercise area at the Jefferson School is designed to provide an outdoor space where orthopedic cases may obtain suitable exercise without coming into too close contact with the more vigorous forms of athletics.

The large grass playfields each contain three softball diamonds, a cinder 100-yard dash, and running and jumping pits. This was considered to be adequate for children at the elementary school level. At the

Thomas Jefferson School this large playfield was graded to the center so that it might be flooded for skating in cold weather.

Other Equipment

Elevators for passenger and freight service were required even though the structures are not multistory. These are intended for use in transporting heavy supplies, injured or handicapped children, heavy projection equipment, and pianos. They are slow-speed hydraulic type machines of relatively low cost.

Provisions have been made for sizable storage rooms in the basements, but the custodian is expected to keep smaller quantities of supplies in his receiving room on the main floor, ready for issue. This room is really a supply office and all incoming supplies pass through it. All supply accounting will be done here. In the Thomas Jefferson School a small spiral stair direct to the basement supply room is provided.

Incinerators for waste disposal are provided in both schools with hopper doors on each principal level.

Kindergartens are carefully oriented for sunlight, and each has its own fenced outdoor play area. Kindergartens are heated by radiant pipe coils in the floor as well as radiators, and have wood-burning open fireplaces to help provide a homelike atmosphere.

Cloakrooms and toilets for the little ones are provided as well as storage space for folding canvas cots used during rest periods. Consultation with kindergarten teachers brought to light the desirability of toilets screened only by canvas curtains, making supervision easier. Nearly one hundred project cubicles are provided in each kindergarten, all located where a small child can easily reach them, and there are ample storage spaces for materials, games, and apparatus.

Provision for Special Needs

One unusual feature of the Thomas Jefferson School is the provision of a unit for handicapped children requiring orthopedic treatment. This unit is so located that it can be reached easily from a separate entrance and is oriented to the south and east for sunlight.

It is worked into the general plan in such a way that while it is a definite part of the school, pupils do not mix too much with others in the corridors where they might be jostled and hurt by rough play. The adjoining outside play area is sequestered and is placed near an adjoining Old Peoples' Home and the kindergarten to avoid disturbance. The plan for this unit again demonstrates the principle of flexibility. The space may be easily transformed into three normal classrooms.

Detailed planning of this unit is based upon research on the problem carried out by Jack Harris, Assistant Superintendent, while studying at Columbia University.

The plantings on both sites were held at a minimum. Adequate trees to provide shade and enhance the site were laid out. Shrub masses in general were kept close to the building, fences, or natural barriers to reduce damage. In several locations shrubs were planted along fenced property lines to screen the play areas from street traffic or private property. Few trees were necessary on the Reservoir site because of existing growth. Good topsoil available at the Jefferson site is to be stockpiled for use on the new lawn areas at both schools.

It is contemplated that the board will request bids for the two projects at the same time in order to promote efficiency and economy in construction. The interchange of expensive topsoil, for example, would be practicable only if the projects are simultaneously executed.

Finally we wish to express our appreciation for the opportunity of working with such sound and progressive officials. Without the leadership and fine cooperation of Dr. Davis, Mr. Harris, their assistants, and the board of education the results contemplated would be impossible.

MILWAUKEE'S SCHOOL BUILDING PROGRAM

By G. E. WILEY

Architect, Chief of Bureau of Buildings and Grounds, Board of School Directors, Milwaukee, Wisconsin

Born in Vermont of New England ancestry, Guy E. Wiley grew up on a mid-western farm and studied mechanical engineering at the University of North Dakota. His architectural training came through experience in leading architectural offices of Minneapolis, Baltimore, St. Paul, and Milwaukee. For the past twenty-four years he has been in charge of the Architectural Division of the Business Office of the Board of School Directors. This office plans and supervises the construction of the public school buildings in Milwaukee.

Alice looked around her in great surprise.
"Why, I do believe we've been under this tree the whole time! Everything's just as it was!"
"Of course it is," said the Queen. "What would you have it?"
"Well in our country," said Alice, still panting a little, "you'd generally get to somewhere else, if you ran very fast for a long time as we've been doing."
"A slow sort of country!" said the Queen. "Now here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"—*Through the Looking Glass.*

OUR forefathers of early days built little red schoolhouses throughout the land. These were good schools or not, depending on the teacher, but nevertheless they set the educational standards of their time. Life was not easy then, but viewed from the perspective of today it was simple. Other than food, clothing, and shelter, needs were few. School needs also were few—a simple building, inadequately lighted and inadequately heated, some wood plank benches and desks, the minimum of textbooks and supplies, and little else. Teacher and pupils were "on their own." Individual work by the teacher and ambition, industry, and initiative on the part of both the teacher and pupil educated the few. The educational goal and attainment of the majority was but a smattering of the Three R's: "readin', 'ritin', and 'rithmetic." This however was only a beginning, but great men and women got their start in those schools and wrote their names in history. They were among the few who not only ran as fast as they could to keep in the same place, but twice as fast to get somewhere else.

Educational standards advanced; education for all was emphasized and with this progress came better buildings and better equipment. School boards in their provision of better buildings and equipment, teachers in their more thorough preparation for teaching, and pupils in their mastery of changing and broadened curriculums all must run as fast as they can today to keep in the same place, abreast of current educational standards. To keep up with current standards however is not enough, since that but perpetuates the status quo. Progress demands a faster pace, "at least twice as fast."

The continued use of obsolete buildings, equipment, or methods indicates a faltering in the continuity of progress. Some school boards or administrations of the past, quite likely handicapped by inadequate financial support, did not do their best; they did not even run as fast as they could. The failure to keep pace with the changes and improvements demanded in the school building by higher standards of construction and progressive educational methods has produced the problem of the obsolete school building to be found in cities today. Such buildings are not only found in cities, but exist in some rural areas as well.

School building construction programs can logically be divided into two types: modernization programs for existing buildings and new building construction programs. The modernization program should provide for bringing the old obsolete and inadequate buildings up to the educational standards generally represented by the newer structures of the school system. To do this will require enlargements, alterations, and improvements of the old buildings to be retained in service; replacement of those which are inadequate and incapable of being improved or which are improperly located; and discontinuance in use of those in areas where they are no longer needed.

The modernization program is a "catching up" program which is required because of an accumulation of deferred improvements in not keeping the school structures up to current standards year by year or building by building, as the need became evident. As the years go by the scope of modernization need grows, and the amount of work required, and its cost, increases until it becomes a haunting deterrent on educational progress. The inequalities in educational opportunity so

created may put a brake on educational progress and often actually does just that. The newest structures in the outskirts of the city are many years in advance of the old buildings still in use in the older sections.

The usual new building construction program includes the new buildings required by the growth of the city, and may include new buildings which replace obsolete old ones, thus contributing to the modernization program. Too often, however, the magnitude of the needed modernization program which should be undertaken as a part of the building program is so great that no part of it is attempted and the required new construction, which always has priority over replacement or improvement of old structures, constitutes the entire building program. The burden of a considerable group of substandard buildings carried along without improvement year after year is like an interest-bearing debt for which no method of paying the interest or retiring the principal has been provided. It is even worse than that, as it cannot be repudiated or liquidated by going through bankruptcy. It is like Sindbad the Sailor's Old Man of the Sea, constantly carried on the shoulders of the school administration. The burden of the past is not peculiar to building, be it schools or other construction; it is common to many phases of life. Sidney Lanier puts it this way:

> "My soul is sailing through the sea,
> But the Past is heavy and hindereth me."

The City of Milwaukee has a population estimated at 620,000 (1946). Its school construction problem may be considered somewhat typical of that to be found in American cities with populations over a quarter million. Milwaukee has an accumulation of obsolete buildings still in use such as are not generally found in the smaller cities. In small cities and towns school buildings are closer to the people than in the larger centers, and improvements in buildings are less apt to be so long deferred. A few buildings requiring improvements to keep educational opportunities equal is not such an insuperable task as the same task applied to the many neglected buildings of the large city appears to be. Even in the construction of new school buildings improvements are usually found first in the small cities and towns and these eventually spread their influence to the larger centers.

Each city has its own peculiar local conditions which influence its school building programs.

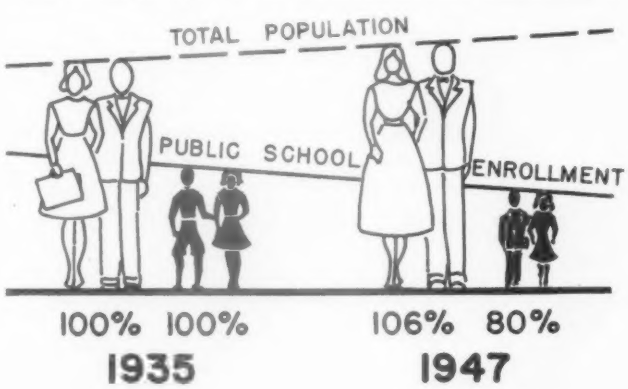
One of the principal local conditions in Milwaukee which affects the public school system is the large number of parochial schools. These schools, together with a few private schools, serve thirty per cent of the school population. The parochial school system has very few kindergartens and not enough high schools to accommodate the graduates of their elementary schools. This results in public school kindergarten and high school enrollments which are disproportionately large.

Another condition affecting school enrollment is the system of vocational and adult education schools administered by the State Board of Vocational and Adult Education, under which Milwaukee has a very large school. The scope of the work offered by the Milwaukee Vocational School is designed to provide for vocational and general cultural education beyond high school for youth in industry and for adults as well. Primarily this work is vocational, but academic work at both the high school and junior college levels is provided. Under conditions specified by state statutes part-time attendance is required of those young people in industry from sixteen to eighteen years of age and is voluntary for others and for adults. The 1946-1947 total enrollment was 34,590, of which by far the greatest number, approximately 28,000, were adults and approximately 6,500 drawn from the total school age population.

Milwaukee, like many other cities, is nearly surrounded by suburban municipalities. From time to time adjacent areas from township organizations are annexed to Milwaukee. These areas come into the city to take advantage of city services, among which schools are important. The periods of the greatest growth in city population have been partly due to expansion by annexation of areas from adjacent townships and in one instance, North Milwaukee, consolidation with an adjoining municipality.

Population Growth

The population growth of Milwaukee has been irregular; the gain in the decade from 1910 to 1920 was 22.3 per cent; from 1920 to 1930, 26.5 per cent; and from 1930 to 1940, only 2 per cent. However, from 1930 to 1940 the combined population of six adjacent suburbs increased 20 per cent. Statistics on population growth show a tendency toward a stationary condition as to the city population with a continued growth in the adjacent or adjoining suburbs which, with two exceptions, West Allis and West Milwaukee, are all residential in character. Comparison of birth statistics with primary school enrollments shows a wide discrepancy. This is caused by the movement of

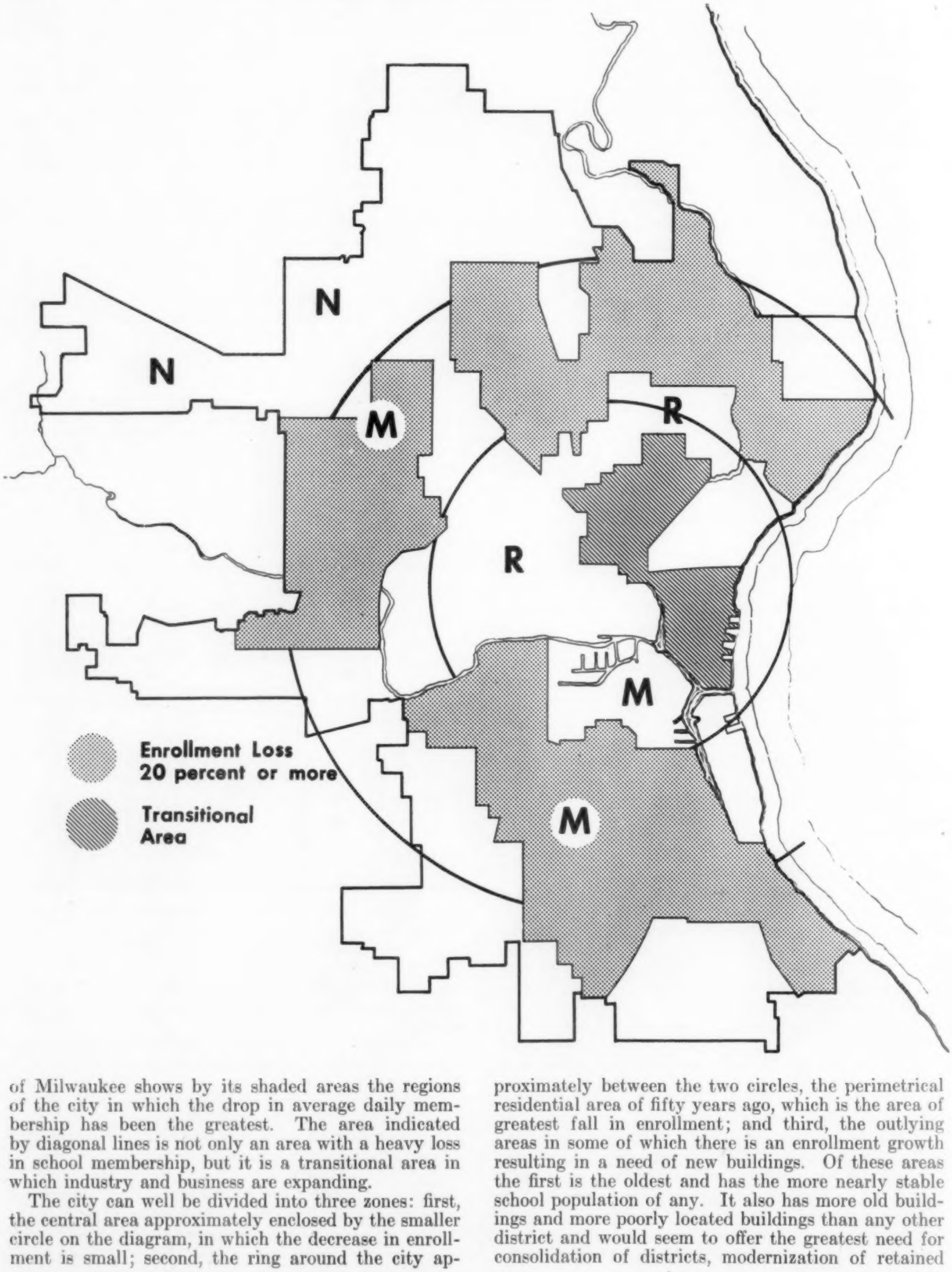


city residents, mostly young couples, to take advantage of the improved living conditions of suburban localities.

While the total population of Milwaukee has grown at varying rates through the years, the yearly average membership in the public schools increased annually up to the high point of 85,162 in 1935-1936. Since that year there has been a continued decrease to the figure of 68,184 for 1946-1947, which is a drop of approximately twenty per cent in ten years.

A Look at the City

Enrollment statistics for individual school buildings show a general decline in enrollment in nearly all schools in the older portions of the city. The diagram



of Milwaukee shows by its shaded areas the regions of the city in which the drop in average daily membership has been the greatest. The area indicated by diagonal lines is not only an area with a heavy loss in school membership, but it is a transitional area in which industry and business are expanding.

The city can well be divided into three zones: first, the central area approximately enclosed by the smaller circle on the diagram, in which the decrease in enrollment is small; second, the ring around the city approximately between the two circles, the perimetrical residential area of fifty years ago, which is the area of greatest fall in enrollment; and third, the outlying areas in some of which there is an enrollment growth resulting in a need of new buildings. Of these areas the first is the oldest and has the more nearly stable school population of any. It also has more old buildings and more poorly located buildings than any other district and would seem to offer the greatest need for consolidation of districts, modernization of retained

buildings, and replacement of certain buildings with new structures.

The Five-Year Building Program

A special committee known as the Five-Year Building and Future Sites Commission is appointed by the Superintendent of Schools from time to time to give advance consideration to future building needs. The Commission is made up of two members of the Board of School Directors, three members of the Superintendent's Staff, the Secretary-Business Manager of the Board, the City Planning Director, and the School Board Architect. They make a study of building needs for a period of five years in advance and present a report to the Board of School Directors with a recommended building program. If, after a lapse of perhaps two or three years new conditions seem to demand a change, this commission may be reconvened, the building program restudied, and a revised report prepared.

The recommended current five-year program, **1948-1953**, is made up of the following items, which are indicated on the city diagram by group letters.

1. Group N. New Buildings.
   Elementary School at N. **81**st and W. Locust Sts.
   Elementary School at N. 51st and W. Keefe Ave.
2. Group M. Modernization, Additions and Improvements.
   Washington High School
   Boys' Technical High School
   Kosciuszko Junior Technical High School
3. Group R. Replacements.
   West Division High School.
   North Pierce Elementary School.
4. The establishment of a general modernization fund is recommended and the sum of **$1,000,000** per year not allocated to specific projects or buildings is suggested.

In the description of individual items of the building program to follow, only those considered of general interest are presented. This building program is very largely devoted to improving the existing physical plant of the school system, the added buildings being two small elementary schools in outlying areas. In estimated cost only eleven per cent of the total is for additional buildings.

The fact that since the peak year of **1935-1936** the annual public school average membership has dropped twenty per cent makes possible a program of replacement and improvement of the existing school buildings. Except for the needs of growing areas on the perimeter of the city and of newly annexed areas, no addition to the present public school physical plant is needed at this time (1947). In fact there are classrooms to spare, but unfortunately full use of these rooms is impossible as these empty rooms are not located in the right places—and they cannot be moved.

The present situation of need for new elementary schools in the outskirts of the city and the existence of unusable empty rooms in many buildings in the inner portions of the city indicate the need of a change in the type of elementary buildings. Since the school population began to decrease annually instead of increase, it has become increasingly evident that elementary schools should not only be flexible in plan, but they should be elastic in size as well.

Instead of permanent buildings of the size required by the possible maximum load, a smaller building might be provided in the form of a central permanent unit. This unit could contain the minimum number of classrooms, rooms for community and general school use, such as the library, assembly hall, gymnasium, lunchroom, specialized activity rooms, etc., and administrative and service facilities. For future growth additional classrooms and any other required facilities could be added of a semi-permanent prefabricated and demountable construction which would permit removal when no longer needed and re-erection to enlarge some other building needing additional classrooms. These buildings would then have a considerable degree of elasticity. It would be possible to make the movable rooms just as attractive and just as completely equipped as the rooms in the permanent section of the building. So handled they would be more expensive than the usual portable wood temporary buildings, but they would be of better and more durable materials and equal in every respect to the permanent rooms of the school.

A New Building

The North 81st and West Locust Streets School, the first of the two new elementary schools for Milwaukee for which plans are being made, is of the type just mentioned. The present structure is an L-shaped one-story permanent unit. Advantage is taken of a drop in the grade of the site in planning the ground floor area of this unit to make future classroom use of its two "activity" rooms possible. Provision is also made in the plans for service connections to the future classroom units. Such units may be provided by any or all of three different additions, a second story (1) on one side of the corridor, (2) on both sides of the corridor, or (3) on a masonry foundation as an extension to the permanent classroom wing. Thus the building may be expanded by two, four, seven, or nine classrooms, and when these additional rooms are no longer needed at this building they may be taken down and re-used at some other location.

A feature of the plan of this school is the separation into two distinct departments in two wings under one administrative center. The present provisions are for a primary division in one wing, which consists of two kindergartens, two first or second grade rooms, an inside monitor lighted play area, and access to the gymnasium. The other grades up to and including grade six are accommodated in the other wing, which also has access to the gymnasium. The classroom unit in this section is a new type in Milwaukee. Heretofore the standard classroom has been twenty-three feet wide and thirty-two feet long with a cloakroom space six feet wide, including the partition, at the end of the room. The new type classroom is a forty-foot unit. This is an addition of only about two feet to the length of the old classroom unit. The increase in the floor area of the classroom provides a work space at the end of the room with work counter, storage space, and sink. Built-in wardrobes open into the rear corner of the room. The details shown indicate seating in the conventional straight line arrangement. This

North Eighty-First and West Locust Street School

is to indicate the seating area. The actual arrangement of the seating may be any which will fit into the space.

Window lighting is by light directional glass block starting at six feet above the floor and a clear vision strip window three feet wide below it. This vision strip may be provided with eight-inch wide flat vanes over approximately the upper half of the window which can be drawn up into the head framing. These vanes are shown by the perspective sketch of the room. Venetian blinds or translucent white roller shades may also be used. The flat vanes are the most practicable for south exposures. The purpose of shading is to keep sunlight off the pupils' working surfaces and to provide a type of shading which when let down or drawn will not shut out an appreciable amount of daylight from the classroom. The lower part of the window, which contains hopper type ventilator sash, is left unshaded.

As an integral part of the community in which it is located, the school should be so designed that such facilities as may serve both school and community should be easily accessible. In this school the lunchroom and activity rooms of the basement floor and the gymnasium on the first floor are designed with adjacent storage and toilet facilities for convenient community use.

A Building Modernization and Improvement

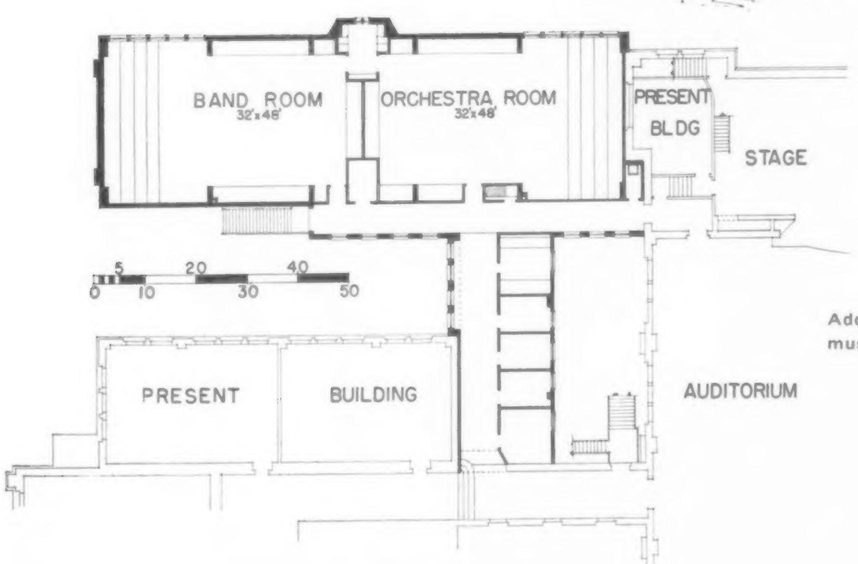
The Washington High School building is not one of the older high schools. It was built in **1915**. Since that time there have been many changes in the educational facilities afforded by modern high schools. Many improvements have been made at this school and many more are needed. The most inadequate provision of all is that for the music department. The new music department for which plans have been prepared is located adjacent to the auditorium stage and connected to a school corridor. Two music rooms, a small music storage space and five small practice rooms are all provided on the second floor. The space below the practice rooms and corridor is enclosed and provides additional height and daylight for the boys' swimming pool immediately below. The music rooms are over an open space which is used for badly needed bicycle racks. Site limitations and building code requirements limit these rooms to the space they occupy. No change can be made in any direction, including "up," except in length. Instrument cases line the rooms and at one end of each room the floor is stepped up and fixed seating provided. Natural lighting is by a monitor over head.

A Building Replacement

The first unit of the present West Division High School was built in **1899**. It has outside walls and interior corridor walls of brick bearing wall construction. Other interior construction is of wood joist floor construction, wood stud partitions, and wood stairs. Since **1899** there have been a number of additions, all but the rebuilding of the gymnasium of similar non-fire resisting construction. This building is to be replaced by a new building for which preliminary sketches have been made. These sketches are for a building to house both a senior and a junior high school.

The territory served by this school is in the older central part of the city. The present building occupies less than a complete block. This site has been enlarged by the acquisition of the adjacent block and the balance of the block in which the old building is located. With the vacation of the street between the two blocks the enlarged site can be arranged to permit construction of the new building and maintenance of school in the old building. On moving into the new building the old building will be razed and its site will become a part of the new athletic field. The street on the south side of the school is a heavily used main arterial highway, which is planned for future development as a limited access "expressway."

The shape of the site and the temporary necessity of locating both old and new buildings on the site and the further requirement of an athletic practice field led to the L-shaped type of plan adopted. The short leg of the L is the physical education building located at the end of the field. The long leg of the L is the main school building. The auditorium is in the heel of the L convenient to both wings. On the first floor level the space between the physical education building and the main wing of the school is open. A wide walk runs along the length of the building and through the wings and connects the minor side streets. With the exception of the separate auditorium and

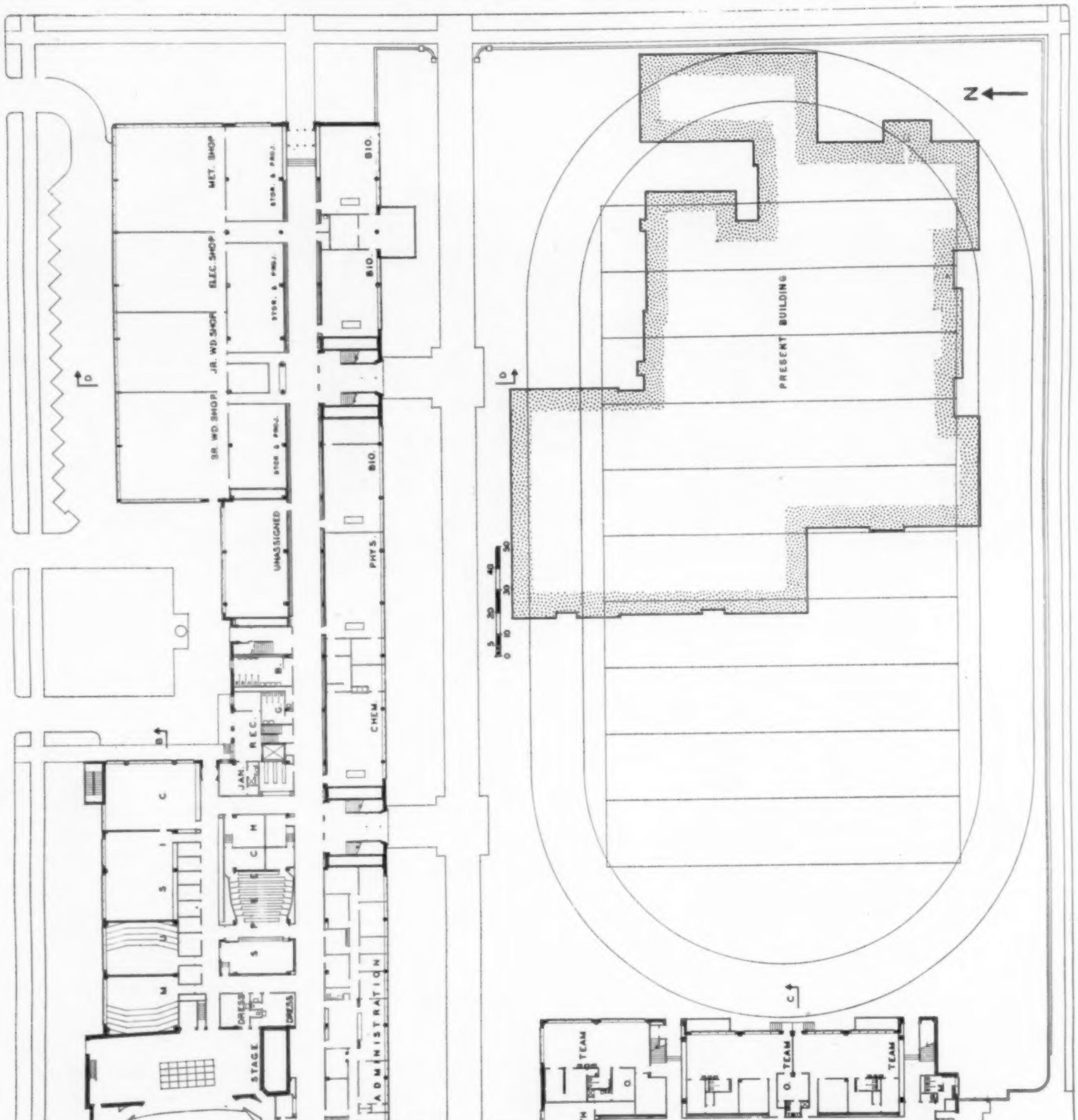


Addition to Washington High School is a new music department.

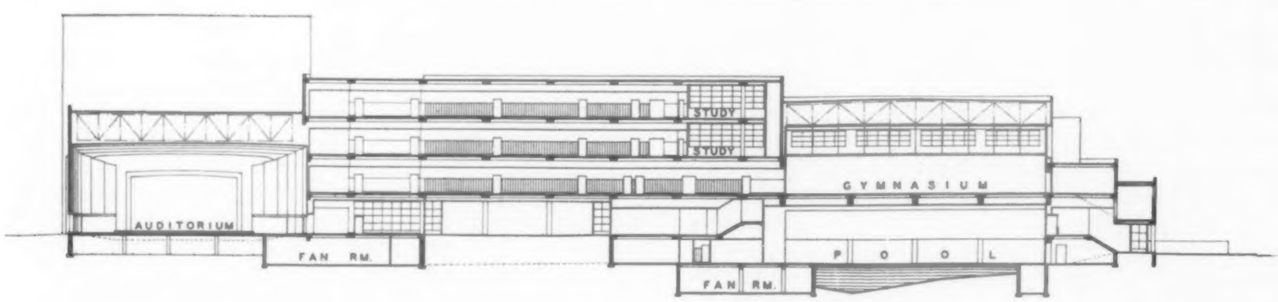
gymnasium entrances, all exits from the school open onto this walk, thus keeping pupils from leaving the building directly onto the main thoroughfares.

In general the classrooms of the junior high school are located in the short wing of the building which extends to and over the physical education section. The senior high school classrooms and the specialized department rooms, library, and cafeteria are located in the long wing. On the first floor of the physical education wing there is a swimming pool with shower and locker rooms, and on the field side of the building the athletic team rooms. On the second floor of this wing there are three gymnasiums separated by folding partitions to open them all into one large area. The boys' and the girls' gymnasiums are at the ends and the center is arranged for use either by the boys or the girls. In general a study of the plans will explain the building arrangement much better than it can be done by a written description. One feature which requires written explanation is the provision for flexibility in room arrangements by means of movable partitions at ends of rooms.

Flexibility is a highly desirable quality, but it can be attained by moving pupils instead of partitions.

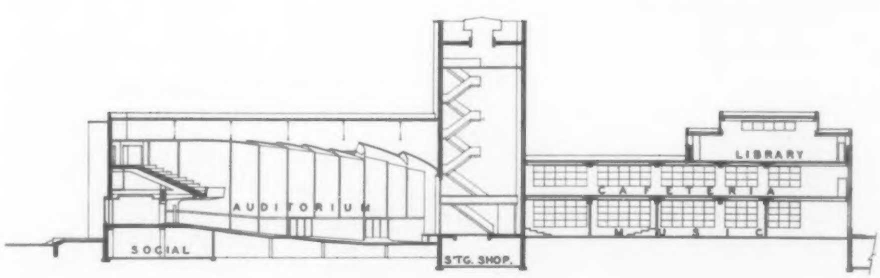

PRESENT BUILDING
MET. SHOP
ELEC. SHOP
JR. WD. SHOP
SR. WD. SHOP
STOR. & PROJ.
UNASSIGNED
BIO.
PHYS.
CHEM.
REC.
JAN.
ADMINISTRATION
STAGE
DRESS
AUDITORIUM
TEAM
HEALTH
CHILD CARE
UPPER PART OF POOL
N

Proposed West Division High School. At left is first floor plan.

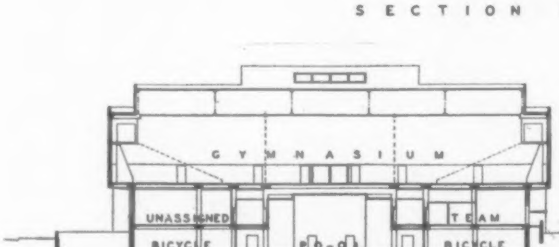


SECTION A-A

Cross-sections through building of proposed West Division High School.

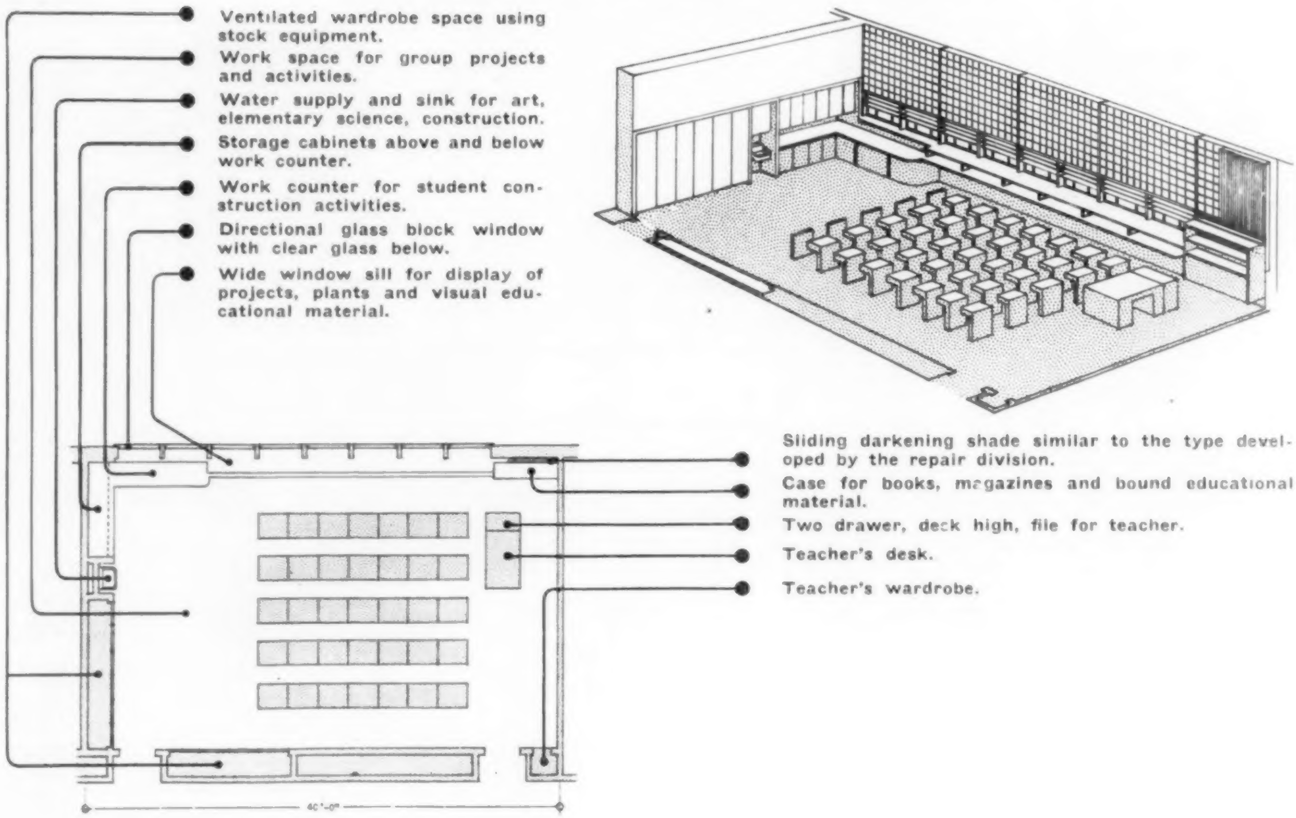


SECTION B-B



SECTION C-C

SECTION D-D



Classrooms vary in size, and if small classes use small rooms, unused classroom space may be partly avoided. It is not necessary to provide for changing all end walls of rooms; flexibility in space may be limited to certain sections. The partitions of much of the building may be of a permanent type of construction. As a step toward a high degree of flexibility, heating, ventilation, and lighting will be arranged to serve unit areas and not rooms. A room may consist of one, two, three, or more units, and when rooms are changed in size by units of area mechanical services are not affected in any way except in their controls. Changes in room sizes will require no rearrangement of mechanical services at all, except the matter of controls, which are based on rooms instead of units of area. The unit area system can be extended throughout and in all permanent rooms the controls originally built in may be permanent. In areas likely to be changed, and that is really rather a small part of the whole, controls must be changed with room size changes.

To provide the utmost elasticity and to improve heating and ventilating service the building is zoned and individual units with the necessary controls provided for each zone. With zone controls it would seem that changes in individual room control could in most cases be reduced to lighting switches only, for which provision will be made.

The construction of the new school will be postponed temporarily because of the acuteness of the housing situation. This description and the illustrations are of the ideas for the school, not the accomplishment.

General Modernization

The general modernization part of the building program, for which one million dollars a year is recommended, is a step toward realization of the Board's Postwar Construction Plan of 1945 for Deferred Maintenance and Improvements. At that time a general study was made of physical plan improvements and desired educational betterments for all buildings and a comprehensive preliminary report made. This report covered both deferred maintenance and improvements by types of work. Deferred maintenance is maintenance required but postponed for lack of funds or during the war for an all-out war effort including manpower, material, and money. This deferred work was added to the improvement items of the report. Maintenance year by year under the regular maintenance routine to the extent that it is possible under the funds provided is not included under *General Modernization*.

Summary sheets included in the 1945 *Postwar Deferred Maintenance and Improvement Program* show a tabulation of the required work by buildings. Individual reports, building by building, in which the work is discussed in detail, are being prepared for use in establishing a definite work program.

When this program has been formulated and adopted, when the funds are available, and when work has been started on perhaps a few of the 33 three- and four-story non-fire resisting older buildings now in use, then, in the words of the "Queen," perhaps we will run twice as fast and "get somewhere else."

ILLINOIS WESLEYAN BUILDING PROGRAM

By RAYMOND DOOLEY

Director of Student Personnel, Illinois Wesleyan University, Bloomington, Illinois

Being a native of Bloomington and a graduate of Illinois Wesleyan, Mr. Dooley has more than an academic interest in the university's development. He secured an M.A. in history and political science at Harvard and began his educational career as Assistant to Director of Admissions at Stephens College in Columbia, Missouri. In 1943, he became Director of Admissions at Wesleyan, and in 1946, Director of Student Personnel Services. He is a member of the American College Personnel Association and American College Public Relations Association.

JANUARY 9, 1943 is a memorable date in the history of Illinois Wesleyan University in Bloomington, Illinois. During the evening of this day, in a monumental blaze which local residents still discuss, the university's principal classroom building, Hedding Hall, erected in 1870, went up in flames. This disastrous fire removed all the administrative offices and two-thirds of the classroom space from the university. This loss, plus the uncertainty of wartime conditions, led many to believe the institution might have to temporarily suspend its activities. However, due to the heroic efforts of the administration and members of the student body, not a single day's classwork was missed.

Administrative offices were set up temporarily in the basement of the Library Building and classes were scheduled at all hours throughout each day, using every possible classroom available throughout the

The student union building is called Memorial Center in dedication to those who served in World War II.

other buildings. The fire, however, made physical expansion of the university absolutely imperative.

Illinois Wesleyan is a small co-educational Liberal Arts college related to the Methodist Church. Being entirely dependent on private support, it had lagged during the depression in its building program. The latest building, erected in 1929, was Presser Hall, which houses the college's well-known School of Music.

Wesleyan Builds for Her Second Century

The administration and some members of the Board of Trustees have since looked upon the fire as not so much a disaster as an opportunity. The great need thus dramatized for new buildings served as an impetus for a successful campaign for funds. Under the leadership of President Merrill J. Holmes, then Vice-President of the University, more than one million dollars was secured for building and endowment. With these funds, four major structures were planned and are now under construction, one of which is all but completed and has been occupied since October, 1947.

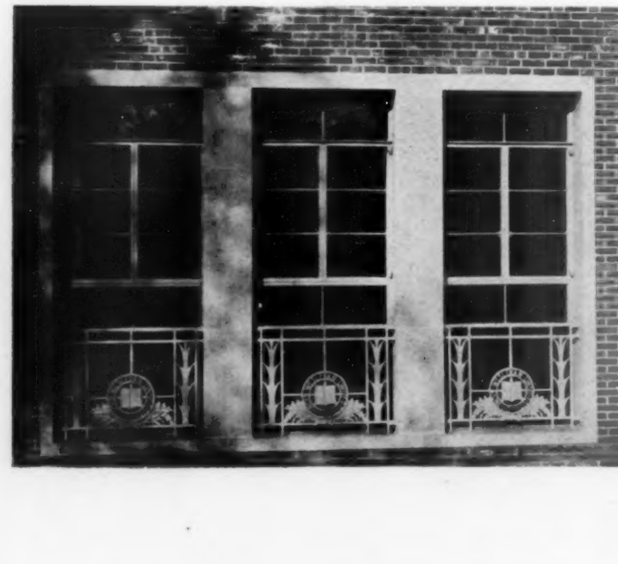
New buildings are a student union building, known as Memorial Center, in honor of those who served in World War II; a women's dormitory to be known as Annie Merner Pfeiffer Hall; a men's dormitory; and a new heating plant. The decision to build these four buildings was made after a campus survey was conducted with an outside adviser.

Administration and classroom space were provided by temporary government buildings and continued use of the first floor of the former Hedding Hall. This latter was remodeled as an emergency during the war and known as Duration Hall. Four large temporary classroom buildings provide new quarters for the Health Service, faculty offices, and classrooms for economics and education. Purchases of houses adjacent to the campus have provided new quarters for the Department of Art, Home Economics, and infirmary.

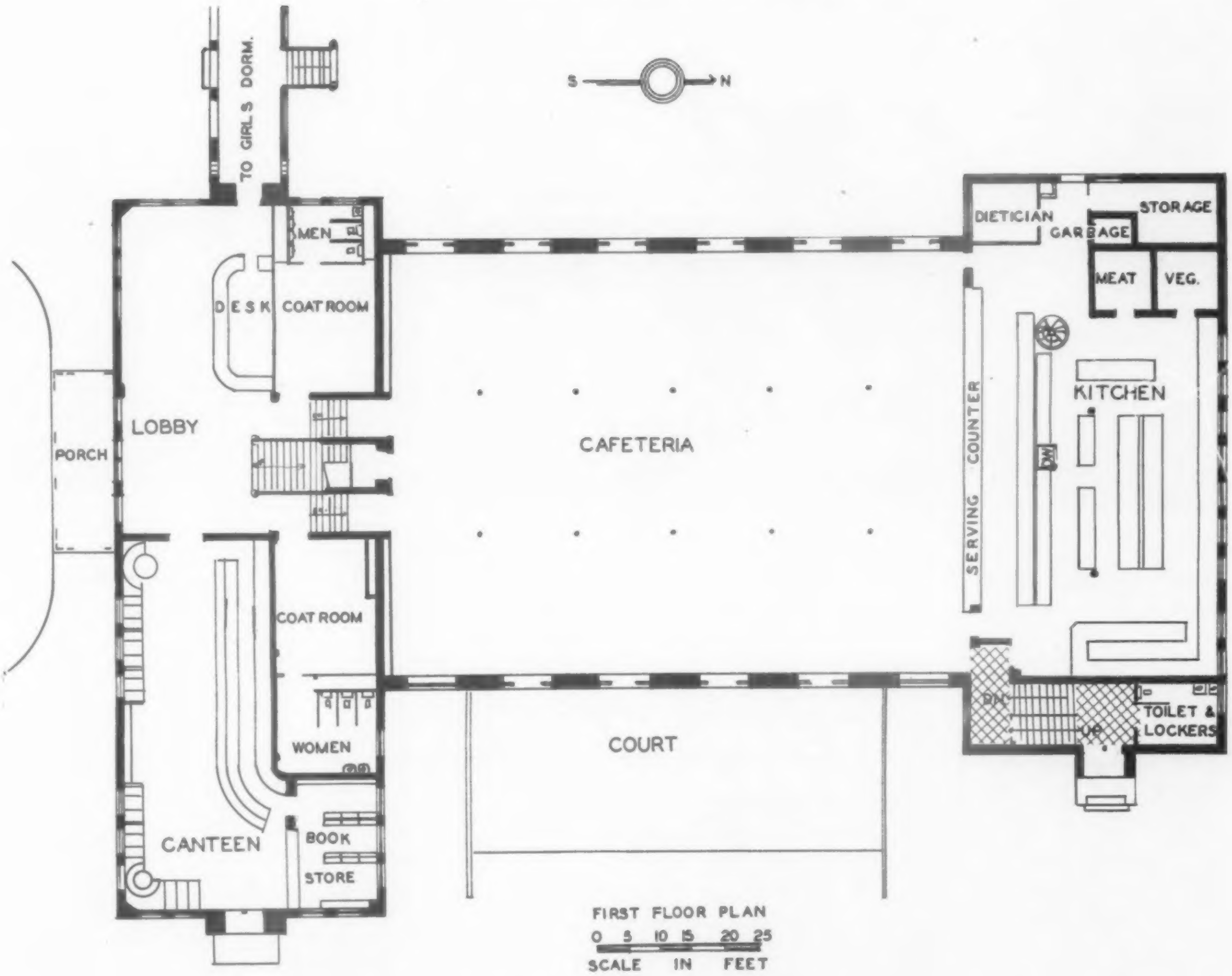
The first great permanent need of the university was for dining facilities and housing for both men and women. The student body, in the two postwar years, has increased from an average of 850 to over 1,250, creating a very acute housing problem. The university had lacked a common meeting place for students, faculty, alumni, and friends for many years. President Holmes felt that this lack impaired the solidarity of campus spirit, a basic value of the small Liberal Arts college. Accordingly, the new Memorial Center was the first building in the million-dollar program.

Since the administration believes that there is no more natural time and place for social fellowship than during meals, the Center includes a central dining-room large enough to accommodate the needs of the entire student body. This dining-room has been arranged to serve in cafeteria style. Located on the first floor of the building, it is arranged with kitchen and serving line to the rear of the room, while tables occupy the rest of the floor. Large open windows on both sides opening to the west and the east admit excellent light at all times. The decorating scheme consists of a floor with a marble pattern of asphalt tile in brown and green tones, sea-foam walls of glazed tile, acoustical plastered ceiling with recessed fluorescent lights, and an unusual treatment of pillars which have been wound with rope to give an interesting decorative detail.

In addition to the cafeteria there is a large lounge directly above on the second floor. This lounge serves



A porch with marquis and iron grill supports in New Orleans style feature the entrance to the student union building. Window guards displaying the university's seal, are on each of the front windows.



The main floor of Memorial Center contains the cafeteria, lounge and soda fountain. A passageway connects with the girls' dormitory on the west.

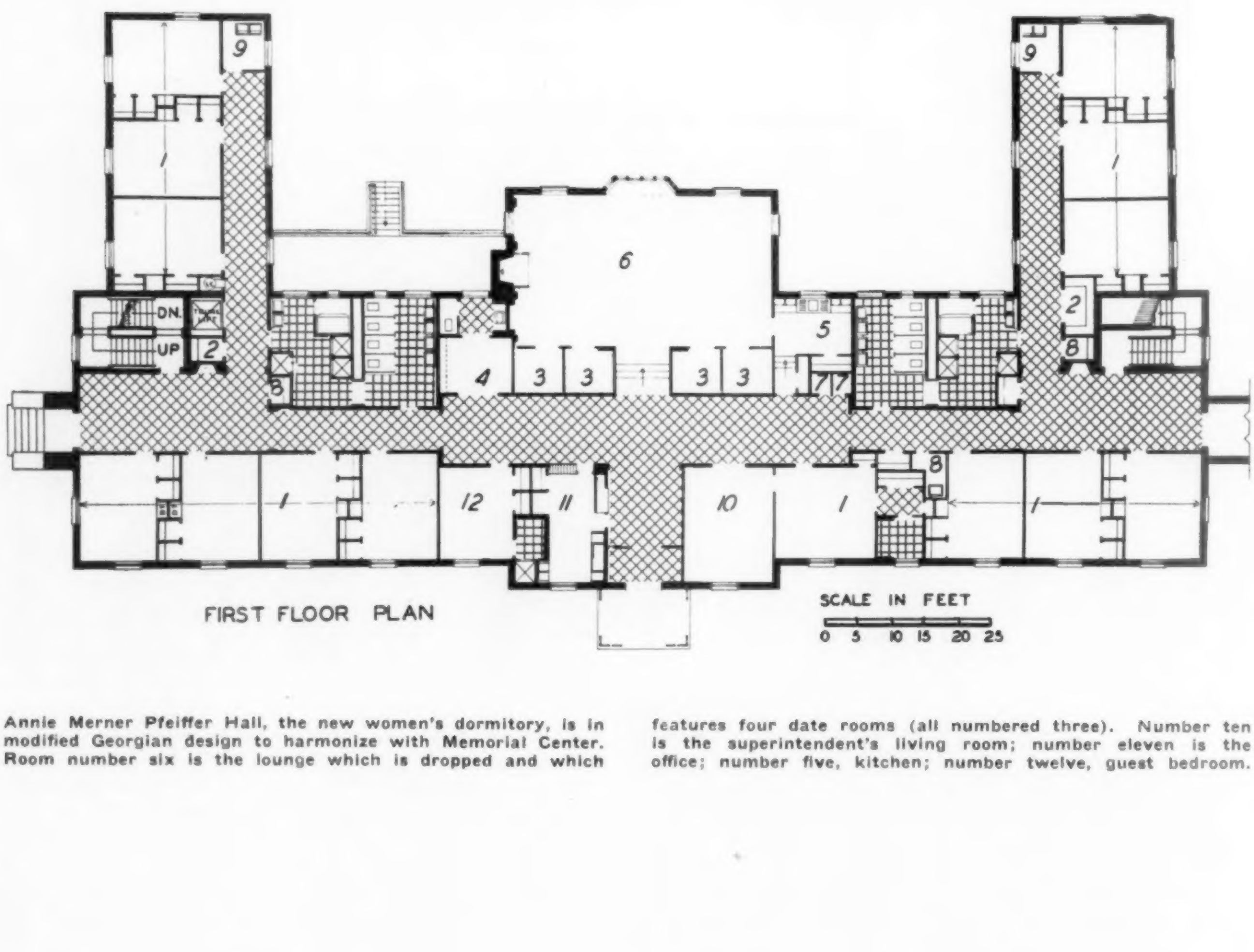
many purposes. It is a casual meeting place during the week and the scene of numerous social functions on weekends and in the evenings. It has 65 by 90 feet of unobstructed floor space. The roof is supported by a series of laminated-wood arches from which is suspended a 16-foot-wide canopy 16 feet above the floor, providing soft light and concealing fresh air ducts. The combination of the arches and the suspended canopy make an unusually interesting room. The decorating scheme consists of light coral-colored walls, featuring wood paneled ends with the laminated arches painted forest green. Behind the main lounge is a second kitchen enabling the lounge to serve as a banquet center in addition to providing space for dances and parties. A small private dining room is at the rear of the room by the side of the kitchen. This has been painted dark green and is known as the Green Room. Modern furniture is characteristic throughout. Already the lounge has been in great demand by school and community organizations for special parties. At one meeting alone—the annual Conference for Methodist Laymen—600 men were served dinner comfortably and quickly.

In addition to the cafeteria and the main lounge, the Center houses a Room of Remembrance which maintains a complete record of all Wesleyan men and women who served in World War II. Adjacent to this room is the office of the Alumni Secretary and all the files of alumni activities. Also there is a small room known as the Quiet Room in which students may withdraw from the active rush of college life for a few moments of spiritual reflection.

On the west end of the second floor is a large room devoted to the faculty. This faculty clubroom will serve as a central meeting point for faculty members of all departments of the university. It has two kitchenettes enabling the serving of tea and refreshments. A decorative feature of the room is a large fireplace in green marble. The walls are a combination of paper, paint, and wood paneling, featuring several tones of yellow and green.

On the east end of the second floor is a large recreational reading room for students. This is paneled in walnut and has a large pink marble fireplace as the central feature of decoration.

On the first floor, adjacent to the lobby, is a large



Annie Merner Pfeiffer Hall, the new women's dormitory, is in modified Georgian design to harmonize with Memorial Center. Room number six is the lounge which is dropped and which features four date rooms (all numbered three). Number ten is the superintendent's living room; number eleven is the office; number five, kitchen; number twelve, guest bedroom.

grill and soda fountain, decorated in glazed tile of sea-foam green with tan leather upholstery on booths and chairs. In a corner of this room the college bookstore is housed.

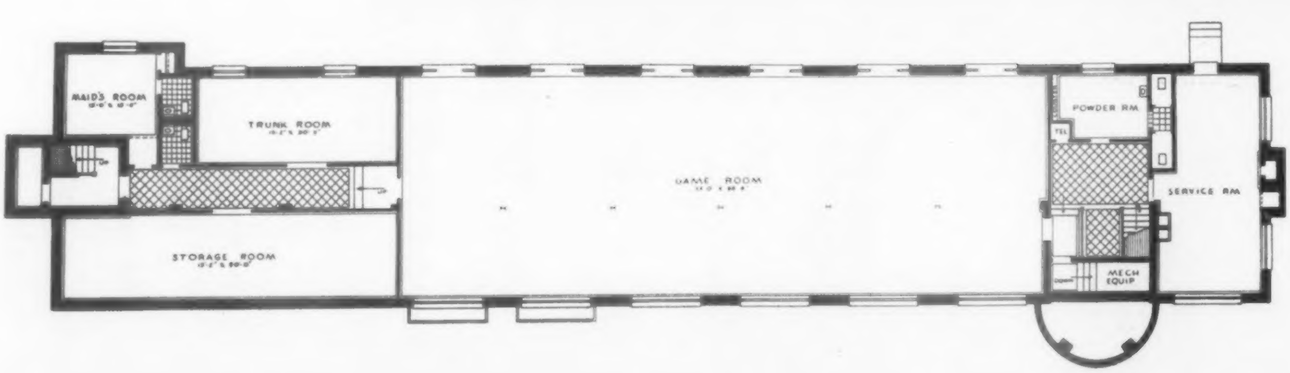
The building is of brick with tile plastered interior partitions, steel windows and steel concrete stairways. The main entrance to the left of the center on the front of the building is the distinctive feature of its design. It consists of a porch with a marquis, a copper roof rising on ornamental grill supports. The unusual grapevine design was executed by the Lorio Iron Works of New Orleans. Ornamental window grills featuring the seal of the university are on each of the nine front windows. Floors are of asphalt tile, except for the kitchens, which are terrazzo. Walls in the kitchen, cafeteria, canteen and restrooms are of glazed tile. Wood paneling has been featured in the lobby and library, while plaster has been used e'sewhere. Ceilings of acoustical plaster have been used for the kitchens, cafeteria, grill, and lounge.

Steam heat via recessed convector radiators is supplied by the university's central heating plant. A central system of fans and blowers in the attic provides fresh air to the lounge, canteen and cafeteria while exhaust fans and blowers are used throughout the building. Indirect fluorescent lighting has been provided and the two kitchens are connected with an electric dumb-waiter, a walk-in refrigerator, and a refrigerated garbage nook in which all dining-room and other refuse is frozen before being removed from the building.

In the second floor kitchen a home economics laboratory for experimental cooking and practical applications of meal planning courses has been provided. The general cost of the building, while not yet completed, has been estimated at $375,000, including general contract, plumbing, electrical and heating equipment, furnishings, and expenditures, but this figure does not include the cost of the land. Schaeffer, Hooton, and Wilson of Bloomington are the architects, as they have been for the other three buildings in the program.

For many years the university had needed a dormitory large enough to hold all the women in the freshman class. In previous years freshman women (who are not eligible to live in sorority houses or rooming houses) have been housed in small dormitory units which have been converted from private residences.

The men's dormitory has a large fireplace in the lounge on the main floor. On the second floor is the residence counselor's apartment. The basement plan, shown below, is for a large game room, trunk and storage space, and ladies' powder room.



As a result largely of the gift of the late Mrs. Henry Pfeiffer of New York City, a new dormitory for women is the second major building being constructed in the Wesleyan building plan. Built in a "U" shape of modified Georgian architecture to harmonize with the new student union building it is located directly west of that structure on University Street and connected to it with a covered passage-way. These two units, located just inside the main gateway to the campus, create a most imposing first impression for the university. The capacity of the new dormitory is 122 plus hall counselors' apartments and guest rooms. The dormitory has been constructed with a reinforced concrete foundation wall, brick veneer on hollow tile; it has concrete floors throughout, placed on bar joists. The floors are covered with asphalt tile, with the exception of the washrooms, which are terrazzo. The walls of the washrooms are of glazed tile; other walls throughout the sleeping rooms of the dormitory are plastered and will have paper covering.

A distinctive architectural feature is the mansard roof which covers the third story. Ten dormer windows extend across the front with three on each wing. The basement of the dormitory is half excavated, housing mechanical equipment, laundry, trunk, and linen storage. The trunk lift rises from the basement to the third floor and a linen chute carries soiled linens from the upper floors to the basement.

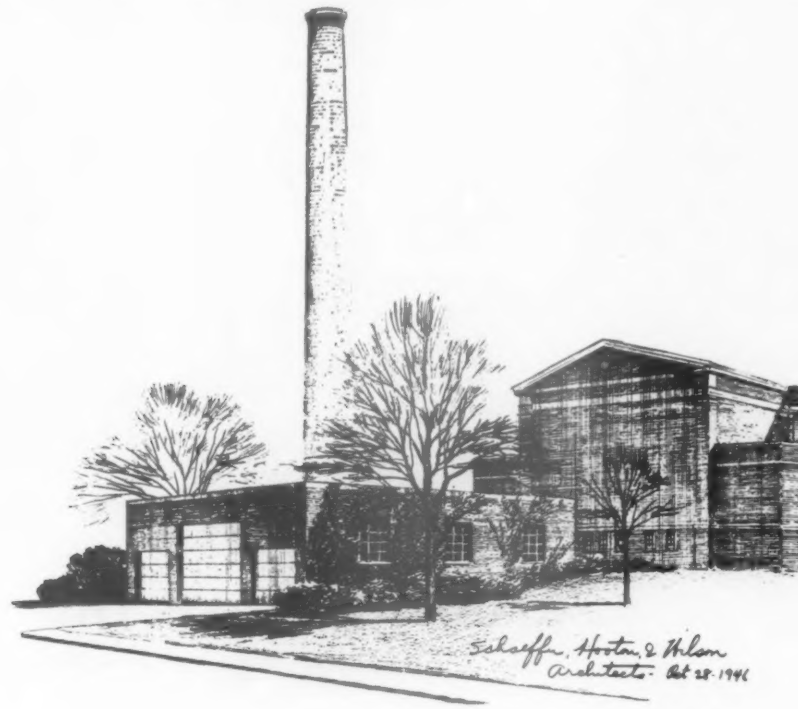
The building faces south. The main entrance opens into a hallway in the exact center of the structure. On the right-hand side of the entrance hallway is the apartment for the residence hall supervisor. On the left-hand side of the entrance is the office and a suite of guest rooms. The main lounge, dropped two steps from the level of the hallway corridor, lies directly ahead of the entrance to the north. A special feature of this lounge consists of four small "date rooms" which give privacy to students entertaining guests. The main lounge is all wood paneling and features a large fireplace on the west end. The paneling will be enameled with the same color scheme as the parlor in the Raleigh Tavern of the Williamsburg reconstruction. The corridor in the main lobby will have knotty-pine wainscoting. A small reception room and lavatory for visitors will be adjacent to the lounge off the corridor to the west, and a telephone and kitchenette will be adjacent to and off the corridor to the right. Bedrooms have been planned throughout for occupancy by two girls. One of the distinctive features of each bedroom will be a built-in dressing table with triple mirror. Furnishings in each room will be of Bird's-eye Maple. Walls will be papered with instinctive patterns in each room. At the end of the corridor along each of the side wings is a built-in laundry for student use. The second and third floors consist almost entirely of student rooms that are reached by stairways located at either end of the main corridors. An interesting feature of each of the second and third floors, however, is the convenient sitting-room located in the center of the main corridor to the north over the main lounge. Each is equipped with a special kitchen unit to provide informal entertaining among the residents. The building was designed by Palmstone, Ayers & Godwin of Atlanta, Georgia, in association with Schaeffer, Hooton & Wilson of Bloomington, Illinois. Construction is now at about midway point and it is hoped that occupancy will be achieved by September, 1948.

A new dormitory for men, designed to hold 98 students, is also under construction. Maintaining the same modified Georgian style as the other buildings, it is of reinforced concrete foundation with brick veneer on hollow tile. Concrete floors are placed on bar joists as in the women's dormitory. All corridors will be covered with asphalt tile, while sleeping rooms will be covered with linoleum. A significant architectural feature is the entrance which features white pillars supporting a balcony upon which a door opens from the third floor.

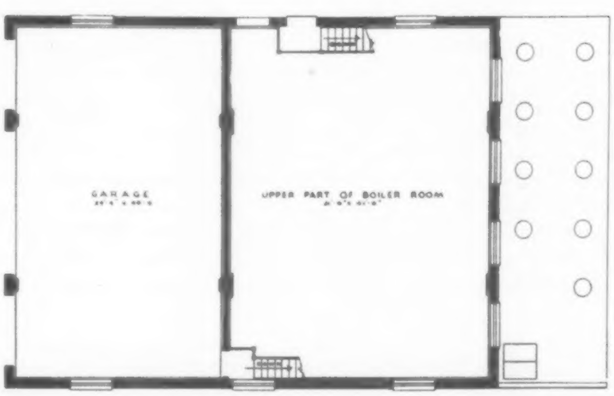
The basement floor of the men's dormitory will be completely excavated and will consist of a large recreation room, storage space, trunk room and service room. A ladies' powder room will also be on this floor. The first floor consists of a large lounge across the entire east end of the building. This lounge has a large fireplace as its distinctive feature. The walls of the lounge will be of plaster and wood paneling, both enameled in green for contrast. Also on the second floor is the residence counselor's apartment, which will consist of a large reception room, bedroom, bath, and kitchenette. Significant features of the bedrooms will be the large amount of built-in furniture. Each unit, which will house two men, will consist of one solid wall of built-in wardrobes, and closets. The opposite wall will have a built-in desk and one of two built-in beds. In the corner between the heads of the two built-in beds will be a large built-in table. A special feature of this table will be a removable top, allowing the interior to be used for storage space for suitcases, tennis rackets, and like equipment. The second and third floors will have a special lounging area set apart from the bedrooms so that students can have games and "bull sessions" without interfering with roommates who wish to study. The second and third floor of the plan are exact duplicates. The building is located directly north of the main campus and west of the Memorial Gymnasium. This is a convenient location, in the center of boys' interests.

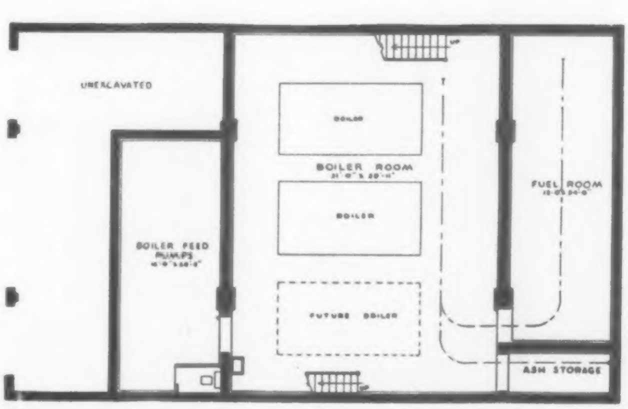
As a result of adding three new buildings to the campus, the demands on the current heating plant would have been so great that a new plant was made absolutely necessary. A modern plant, costing approximately $130,000, has been completed and began operation in January, 1948. Located in such a position as to appear an extension of the rear of the gymnasium, the plant is designed to serve not only the present but the future needs of the institution. It will house two boilers, with provisions for a third. The capacity will be such that heating requirements of any buildings likely to be added to the campus in the future may be adequately served. Provision has been made for the accumulation of coal and ashes within the interior of the plant, while the grounds outside are to be landscaped with shrubbery and trees.

Smoke and soot consumption devices, automatic firing devices, and combustion controls will reduce smoke and ashes to less than those frequently observed in private dwellings. The entirely fireproof building with a brick exterior has interior partitions of brick, and windows and stairways of steel. All floors and interior features are concrete. An exposed roof construction will constitute the ceiling. The



The new additions to the campus necessitated building a new heating plant. Floor plans of the fireproof building are shown below.





plant has water tube boilers and stokers with hoppers featuring automatic feeding and draft control. Special features of the plant include a system of monorails for conveying coal and ash from the boilers to the elevator and electric ash hoist. A 125-foot radiobrick chimney makes the heating plant a landmark against the sky. The 0.56 cost per cubic foot includes all construction but not equipment.

The question of adding buildings to a college plant at this time is a very disturbing one to any administration and Board of Trustees. During the depression, with the terrific shortage of money experienced by most institutions, many people argued that it was a poor time to build because funds could not be spared. Now critics argue that buildings should not be erected because it costs twice as much as it would have cost in 1936, and that building costs will be less later on. However, it should be remembered that students will attend the institution which has the facilities available now. Blueprints will no longer suffice. The feeling of the Illinois Wesleyan administration is that the institution that has the buildings in operation will be the one that provides the educational program which truly serves its clientele. Therefore, in spite of the hazards and handicaps of building at this time, the program has gone forward steadily. Funds are being found available to cover the costs and the new buildings will stand as a significant achievement for a more effective future. Wesleyan's slogan "Building for Her Second Century," which will begin in 1950, is becoming a very definite reality.

An expert instructor teaches driving fundamentals.

Actual bus parts and models illustrate the lecture.

STUDENTS TAKE THE WHEEL IN NORTH CAROLINA

By CLYDE A. ERWIN and Associates

State Department of Public Instruction, Raleigh, North Carolina

OBTAINING satisfactory bus drivers has been one of the most persistent problems which annually arise to harass school administrators. If mere driving competency were the only consideration, the matter would be relatively simple. However, a number of other factors must be considered as well.

Problems concerning the location of the bus garage in relation to the driver's home and the route to be covered; the fair amount of money which must be paid to the driver to make it worth his while to be away from his own business several hours a day; holding to a rigid schedule, regardless of the demands of the school program, so that the driver can make his other commitments on time; finding a man who not only understands children, but who can handle them as well; and assuring oneself of complete cooperation between driver and school authorities—these and many other facets of the school transportation prob-

Driving is done on handicap courses and on the road.

Toeing a four-inch chalk line is part of the course.

Students check themselves on their visual perception.


A driver must be able to see objects on either side.

lem have demanded the attention of administrators with the rapid consolidation of schools during the past twenty years. According to the 26th Annual Statistical Survey of Bus Transportation, 85,872 school buses served the schools of the nation each day during the 1947–48 school year. Finding satisfactory driving personnel for all of these buses has been no small problem.

North Carolina decided to attack the problems one at a time. Who in the community would be most easily available for employment before and after school hours? Who would most readily accept payment for what the job was worth, rather than what his time was worth? Who could be found living on, or near the terminal point of, the bus route? Whose time would be most easily adjusted to possible irregularities in the school schedule (for instance, early dismissal because of an approaching storm, or delay occasioned by a prolonged football game)? Who would be most amenable to suggestions from teachers and principal? Who would be readily available for consultation with administrators and teachers on transportation problems? To all of these questions the answer was the same: the students themselves.

After a little research and experimentation, North Carolina found that the same answer held in determining who would make the best drivers. Student drivers, properly trained, are good drivers. We are inclined to believe that they make the *best* drivers. They learn more quickly, drive more smoothly, and react more promptly than the average adult. Schools throughout the country have become increasingly aware of these facts in instituting driver-training classes. Although the accident record among adolescents in the past has been somewhat alarming, statistics show that the high accident rate among this


Testing for steady nerves and muscular control.


How quickly can the students react to signals?

group has largely been due to improper training or to the use of unsafe vehicles. Young people who have been properly trained in handling vehicles are among the best drivers in any community.

The final consideration—who can obtain the highest degree of cooperation from the youthful passengers—produces the same answer, surprising as it may seem. Psychologists, teachers, and parents have long been aware of the profound respect which adolescents hold for the opinions of their contemporaries; while young children usually have an intense admiration for older youth. In addition, the student driver is closer in point of time to the thinking of his passengers. Because he understands their motives, he is less likely to overlook acts of misbehavior or evidence of uncooperative attitudes, whereas the adult driver is sometimes *too* eager to understand the children's point of view, and thus ignores acts which should be corrected immediately.

Having determined to our satisfaction that competent student drivers would solve our problem, our next step was to evolve a system of selection and then to formulate a program to help the students obtain the necessary competence.

Selection and Training

The authority for selecting and employing school bus drivers is vested in the principal of the school at the termination of the bus route, subject to the approval of the school committeemen or trustees of said school and the county superintendent of schools.

School principals select all potential drivers (candidates) on each prescribed school bus route. The factors in determining the availability of drivers are age, residence on route, and general reputation. These candidates are then called to training centers in their respective counties where they receive both classroom and driving instruction. The time spent in training is determined largely by individual needs of the students.

The training course, offered in the summer, contains detailed instruction in operation mechanics. The driver who understands his engine does not abuse it, and the student finds that many driving techniques, which he formerly regarded as arbitrary demands imposed by adults, are actually based on sound reasoning in terms of longer life to the vehicle, as well as to the occupants of the bus.

The rules of the road governing right of way, courtesy to other drivers and to pedestrians, conduct in an emergency, etc., are learned and explained in connection with laws and regulations referring not only to school transportation, but to all vehicular traffic. Special attention is given to instruction on the handling of children, the school's responsibility for their safety from the time they board the bus in the morning until they are returned to their homes at night, and the driver's moral obligation to the children, their parents, and school for the safety of his charges.

Following the instruction period, applicants undergo a physical examination. If the prospective driver successfully passes all instructional tests and the physical examination, he is then given an "on the road" test by a member of the State Highway Patrol and the chief county school bus mechanic in each county, and either certified or rejected. At least one substitute driver is trained and certified for each bus. This aids in securing ready replacements and is a vital part of the training program, since substitute drivers gain valuable experience and are usually available the following year for regular drivers.

The primary administration of this program is the responsibility of the North Carolina Highway Safety Division (Motor Vehicle Bureau) and is carried on through the coordinated efforts of all school administrative agencies.

Driving Is Education

While a smooth-running school transportation system is a desired end in itself, the administrator who is first of all an educator derives much satisfaction in weighing the benefits to the youthful driver. The student who can assume such responsibilities develops qualities of initiative, foresight, and self-confidence which greatly augment the school's program for character development, and increase the driver's potentialities in assuming leadership in the larger community. Indirectly, all the students who ride the buses are affected, as shown by their growing awareness of proper driving techniques, safety precautions, and consideration for others, both as pedestrians and passengers.

North Carolina schools are proud of their student drivers. They have proved our point that pupils, properly trained, make good drivers; and in achieving a safety record which excels that of adult drivers, they have fully justified our faith in them.

A repair shop for buses requires the same care in planning as a classroom.

PLANNING THE SCHOOL BUS SHOP

By A. R. MEADOWS

State Superintendent of Education, Montgomery, Alabama

THE school bus shop is one of the important buildings that must be provided by boards of education which operate school bus fleets. Like other buildings, the school bus shop should be planned for the service it is to render. Some of the first and major considerations in planning a bus shop are as follows:

1. Is the shop to serve as a service shop only, or is it to be used for storage of buses and service?
2. Are all bus maintenance and repair services to be performed in the school bus shop, or are some items of service, such as painting, to be done elsewhere?
3. Can one central shop serve the entire fleet, or should subshops be established for certain services?
4. Is the shop to be located on a school campus, or on a separate site?

It is generally desirable to provide shop space for maintenance and repair operations only. Storage may be profitable in areas where very cold weather and heavy snows occur, but it generally costs much more than it is worth.

Most school bus shops should provide all the service the fleet needs with possible exceptions of highly specialized services that are not often needed, such as radiator repair.

The geographical location of school centers will be one of the determining factors in deciding whether a central shop can be used for all service on all buses in the fleet, or whether subshops should be provided at school centers far removed from the central shop. Generally speaking, if a central shop can be located near the population center of the district and other terminal schools are no more than ten miles from the shop, one shop building is sufficient for the entire fleet. If distances between terminal schools and the central shop exceed ten miles, it is often advisable to establish subshops at schools having five or more buses. These subshops should usually provide only one service stall and equipment for routine service and minor repairs.

If the shop building is to be built on the campus of

a school building, architectural balance will become an item of consideration, as will space. There must be space for the shop building itself, including a sufficient area for entrance of buses. A parking area near the shop should provide about 500 square feet for each bus in the fleet.

It is often desirable to build the central shop near a school, but off the campus. This will simplify problems of architecture and space, as well as administration.

Details of Shop Planning

When the foregoing considerations have been settled the school board and its representatives are ready to p'an the building itself. Important items to be considered inc'ude the following:

1. Size
2. Floor Plan
3. Special Rooms
4. Construction Materials
5. Lighting
6. Ventilation
7. Doors
8. Heating
9. Storage Space
10. Equipment Installation

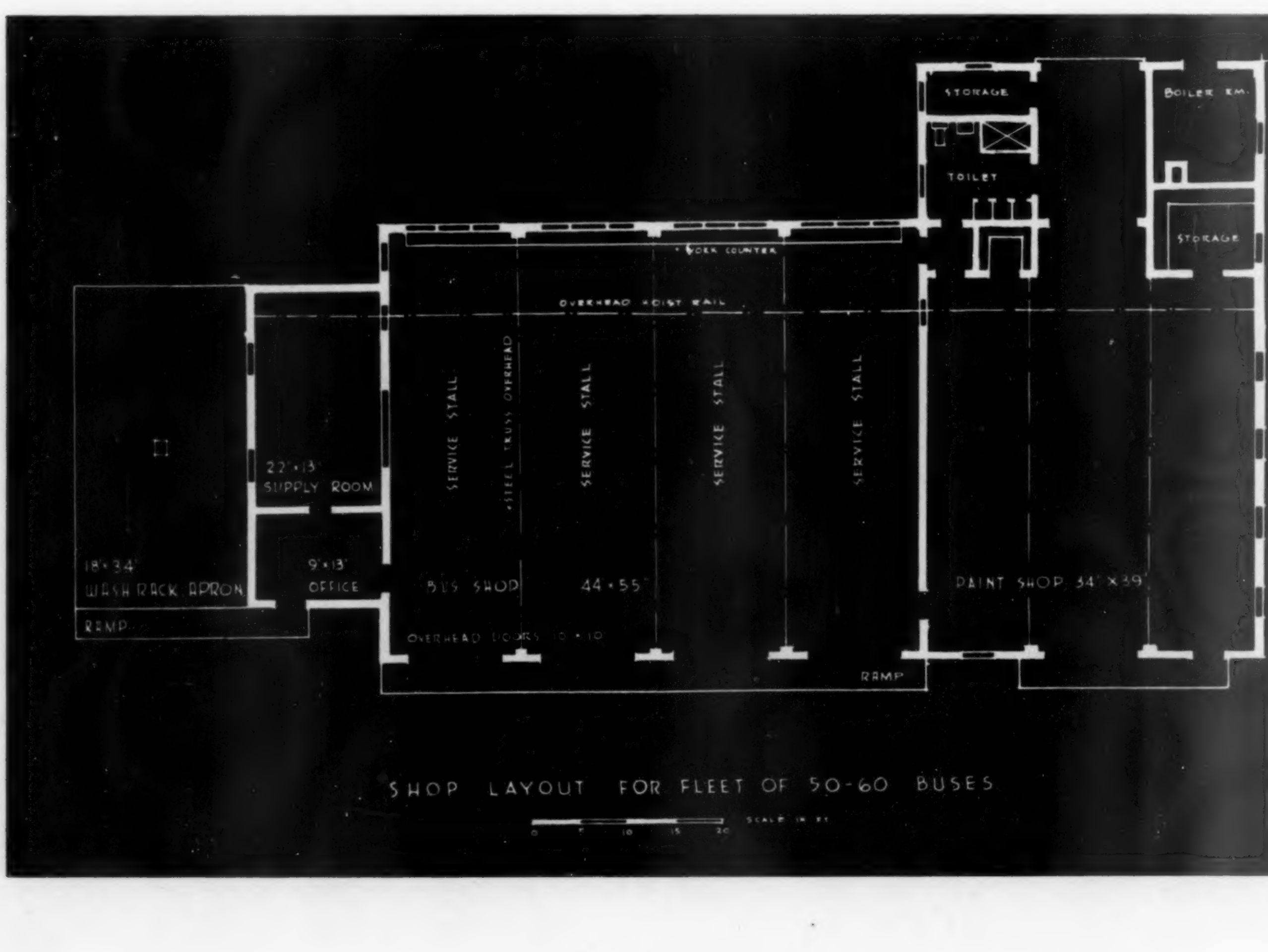
These specific items will vary with certain factors, but they can be considered in the light of experience which has demonstrated the following:

Size. The size of the building will largely be determined by the number of buses to be serviced. A service stall, or work area, should be provided for each fifteen buses in the fleet. These stalls should be large enough to permit work space all around the bus when it is standing in the stall. Usually, a stall should be about sixteen feet wide and forty feet long. In shops where several stalls are located in the same area, the width can be less than if one or two stalls are provided. These stalls should have no obstructions between them or on the floor.

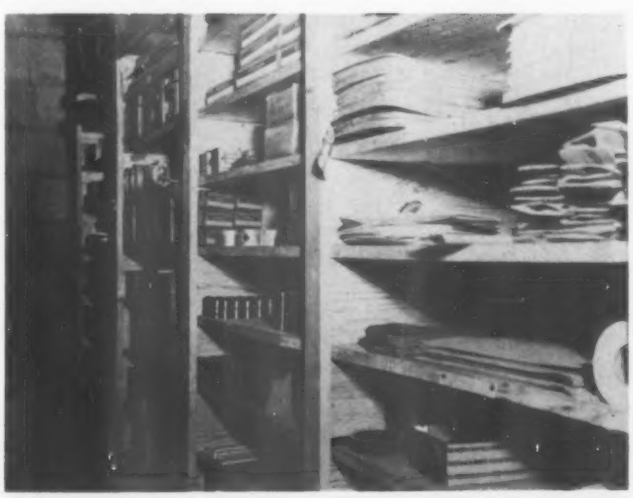
Floor Plan. The floor plan should provide for free and easy access between buses in service stalls, work benches or work stations, and parts and supply storage. The office, parts storage room, ard service stalls will be used most frequently. Their location should be arranged to keep walking to a minimum and make tool and supply transfer easy. It is u-ually desirable to have the office and supply storage room at one end of the rectangular space used as service stalls. This arrangement gives easy access to parts through the office so that proper control can be exercised. Workbenches can be conveniently located across one side of the service stall area. This puts the benches in front of buses driven in for service. Work stations such as riveting machines, grinders, etc., may also be located in front of the service stalls.

Since large entrance doors are required, it is very desirable that the building face the south. This will reduce the amount of heating necessary and will make the shop more comfortable.

Special Rooms. The need for special rooms is de-



SHOP LAYOUT FOR FLEET OF 50-60 BUSES



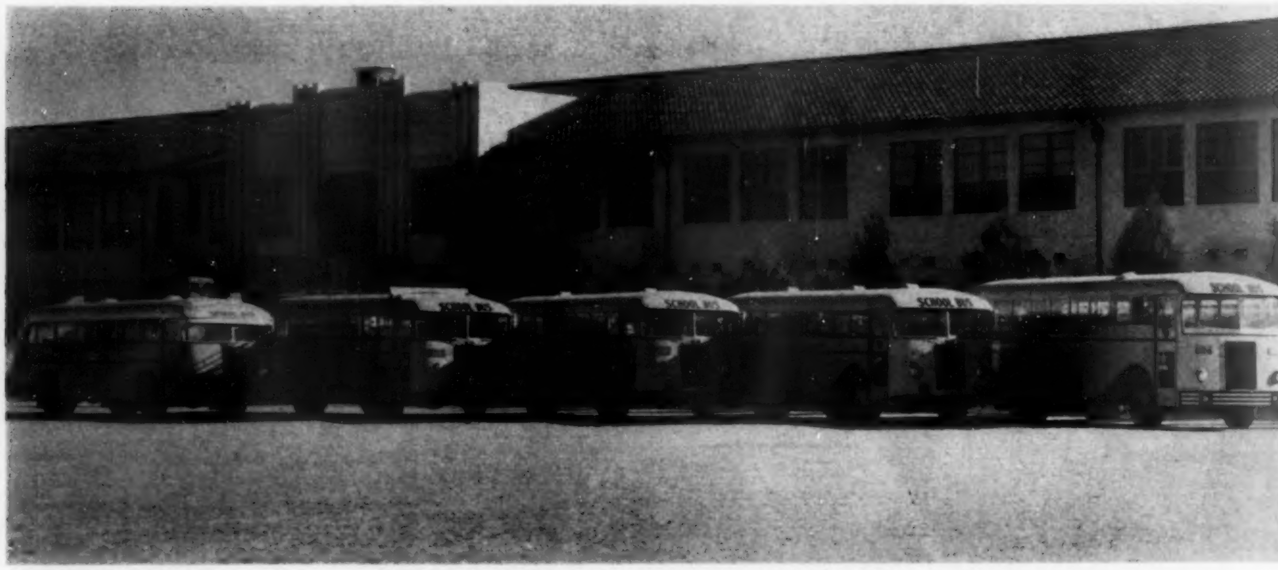
A neat, well-kept supply room should be easily accessible to the service stalls.

termined by conditions. If painting is to be done, a painting room is needed. This room should be closed off from the regular shop, but should be easily accessible. It is usually desirable to locate the painting room at the end of the service stalls opposite the supply room and office. A washing and lubrication room may be desirable in some instances. Washing can be done very satisfactorily on a concrete apron poured at one end of the shop building and a hydraulic hoist may be installed in one of the service stalls and used for lubrication service. Lubrication can also be done in the service stalls without a hoist, since a creeper can be used to get under the chassis.

A heating or boiler room is needed in areas where severe weather occurs. This room should be adequate for heating equipment. A bathroom for shop employees should be provided.

Construction Materials. Construction materials may be chosen to harmonize with those in existing structures on the site. They should be suitable for permanent construction and adaptable to a shop building. The floor should be reinforced hard finished concrete. It should be about six inches thick and from six to twelve inches above the grade line to provide freedom from surface water. A concrete apron should extend at least ten feet in front of the entrance door openings. A thirty-foot apron is desirable. The roof should be constructed so that no supports on the floor are necessary. The roof structure should be strong enough to support a hoist rail for lifting buses and bus units. Walls should be at least fourteen feet high to provide adequate overhead clearance.

Lighting. Lighting should be adequate for work at all times. The side of the building which makes the front end of service stalls should be at least 50 per cent glass. The entrance doors to service stalls should


Efficient and safe service for the community's children.

have at least 40 per cent glass. Artificial lighting should be provided that will be adequate for work at night. The parts storage room should not have windows for natural light and should depend upon artificial lighting exclusively. The paint room should have as much natural light as possible.

Ventilation. Ventilation must be adequate at all times. The large window area should afford adequate ventilating capacity, but overhead or attic ventilation may be desirable. Where bus engines are run inside the shop, ventilation should be forced by means of power fans.

Doors. Doors to service stalls should be large enough to permit easy entrance and exit for buses. These doors should be a minimum of ten feet wide by ten feet high. Doors to other rooms in the building should be three feet wide to facilitate carrying large objects through them.

Heating. Heating should be adequate for the climatic conditions. School bus shops usually require more heating capacity per cubic foot than other buildings do. This is due to the fact that overhead height is greater than in other buildings and large doors must be opened for driving buses in and out of the service stalls. Floor or radiant heating is highly desirable since mechanics work on the floor much of the time.

In areas where little heating is necessary, an ordinary oil-burning or coal-burning stove is adequate.

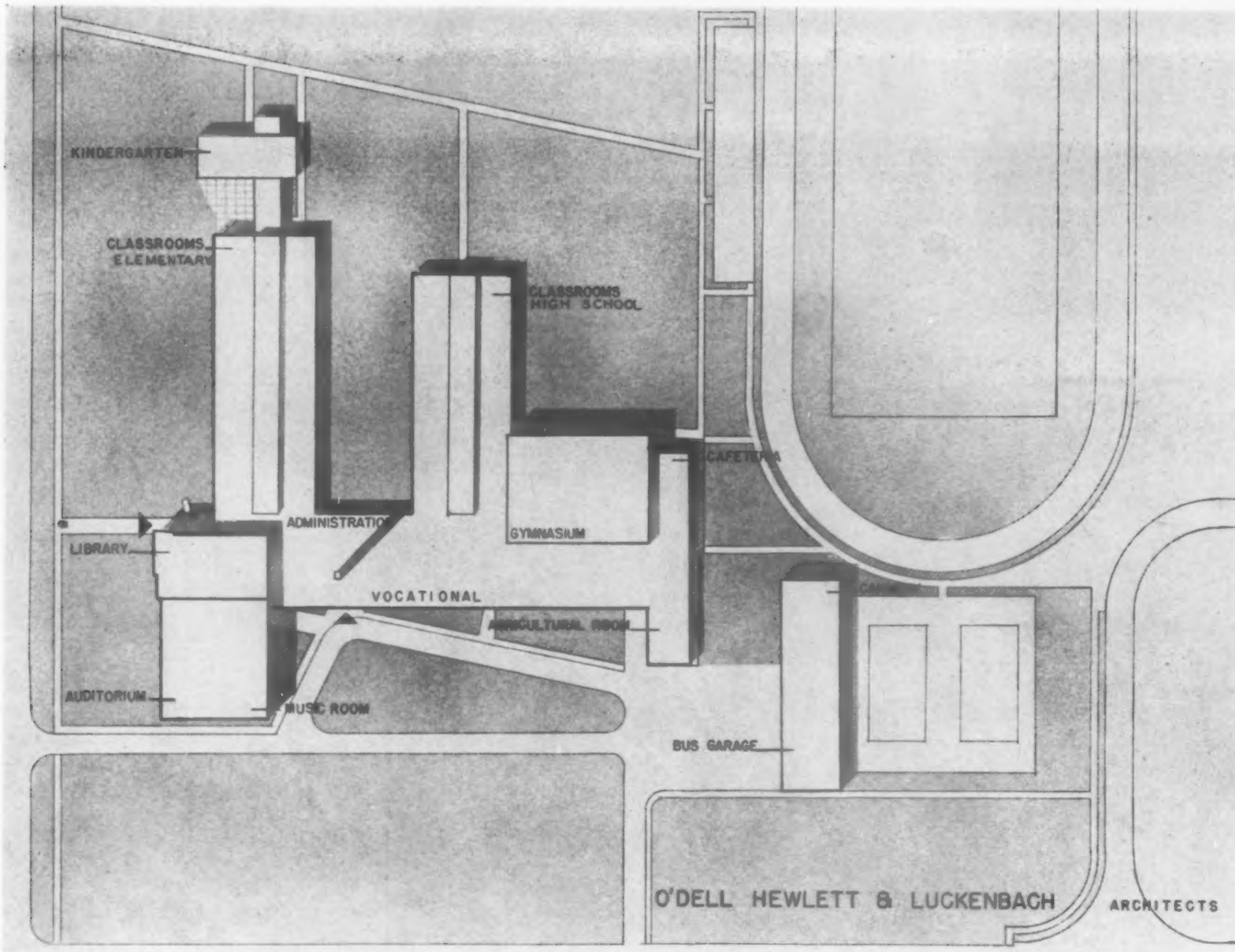
Storage Space. Storage space for items not commonly kept in the parts storage room should be provided. Sheet metal parts and other bulky items can be stored efficiently in the attic. A stairway will make this area easily accessible.

Tires, tubes, and wheels can be stored in racks attached to the walls at the ends of the shop area and under workbenches. Tools can be stored in wall cabinets built at points of advantage.

Equipment Installation. Equipment requiring permanent installation should be planned in advance of construction. Air compressors, welders, lathes, presses, etc., should be placed near the work area. These items should be fastened to the floor near the wall in most instances. It is often desirable to install equipment between and under workbenches at the front end of the service stalls. Air, power, and water lines to points of advantage should be planned. Usually air should be available at each service stall and at most workbenches. Water should be available at each stall and electric outlets for lights and drills should be available at each end of each stall.

A hoist rail should be installed near the front end of the service stalls to run the entire length of the service area. A hoist rail near the rear end of the stalls is often desirable, but is not used as much as the front rail. An "I" beam suitable for mounting a rolling hoist should be used.

It is true, of course, that no general description can solve all the problems of the individual district. Experience has shown, however, that a consideration of the ten factors described is necessary in planning a school bus garage in any district; and when these have been discussed in the light of climatic conditions, funds available, specific needs, and future requirements, the board may feel confident that it has discharged its obligation to plan and provide adequate garage facilities.



Litchfield Community School

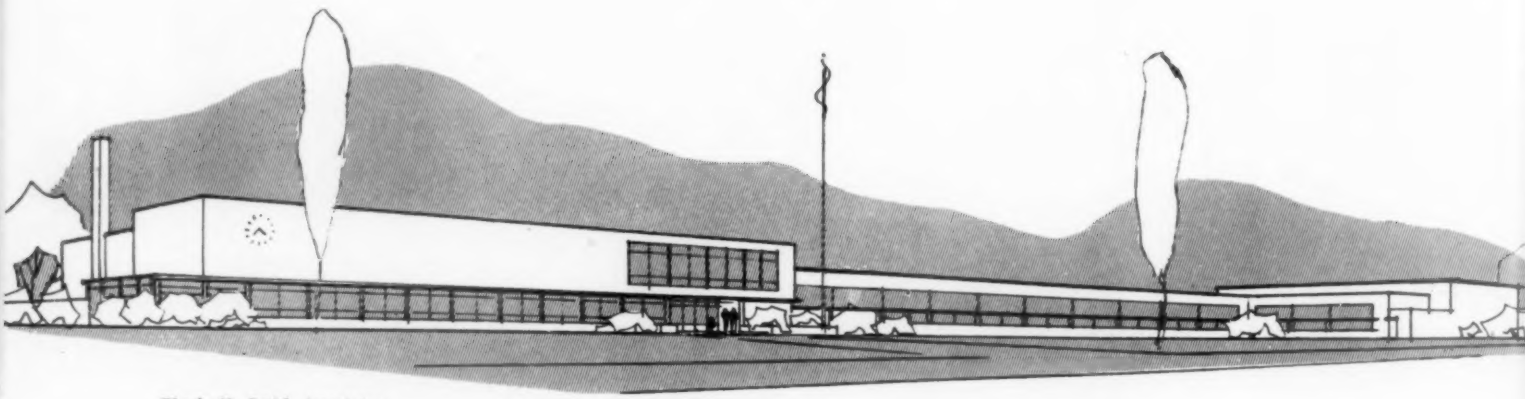
EDUCATIONAL PLANT EQUIPMENT AND FACILITIES

THE AMERICAN SCHOOL AND UNIVERSITY is continuing its practice in this edition of presenting suggested lists of equipment for various purposes. In addition, it is adding illustrations of types of facilities found in good educational plants.

The illustrations of various plant facilities included in this section are presented through the courtesy of architects who made their plans and drawings available for publication. They are worthy of careful study.

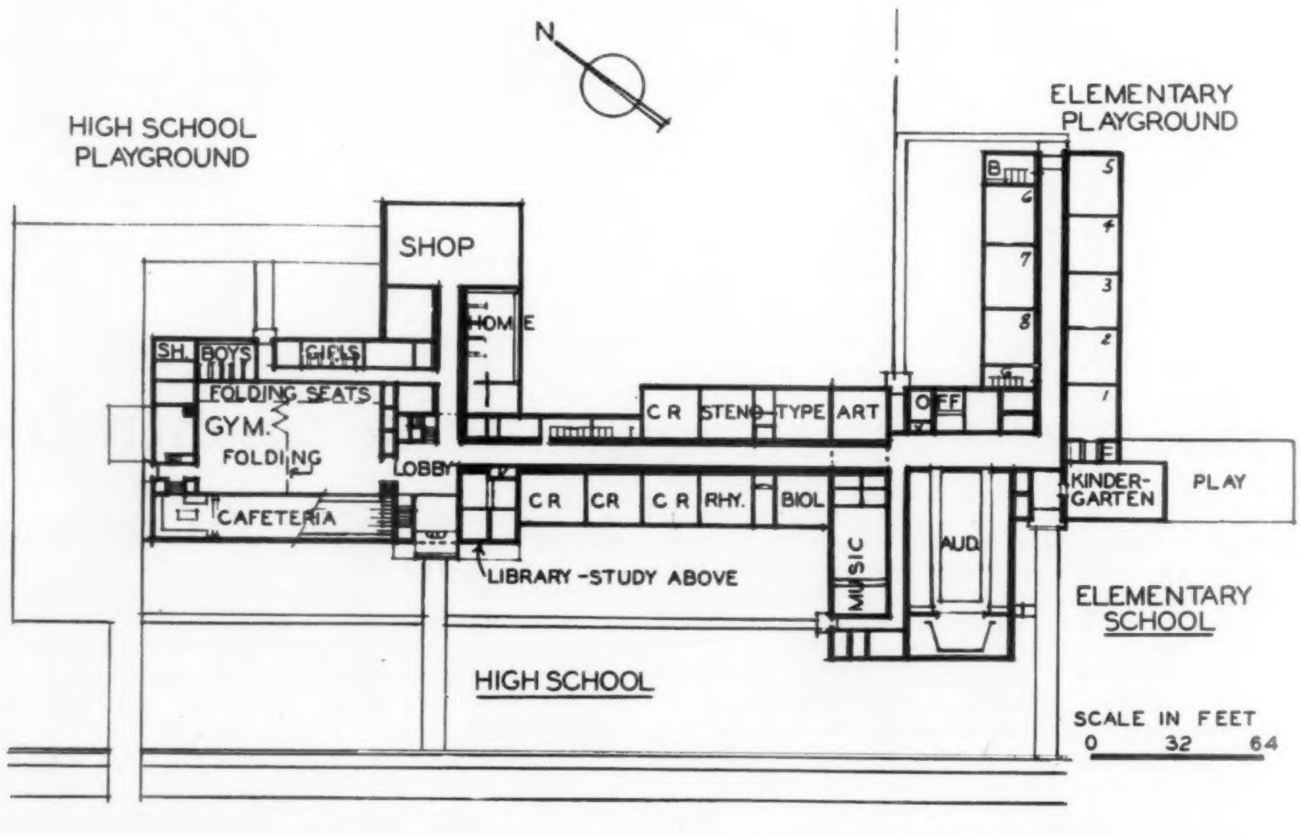
The lists of equipment were developed by a group of graduate students at New York University who were working with the editor of THE AMERICAN SCHOOL AND UNIVERSITY on educational plant problems.

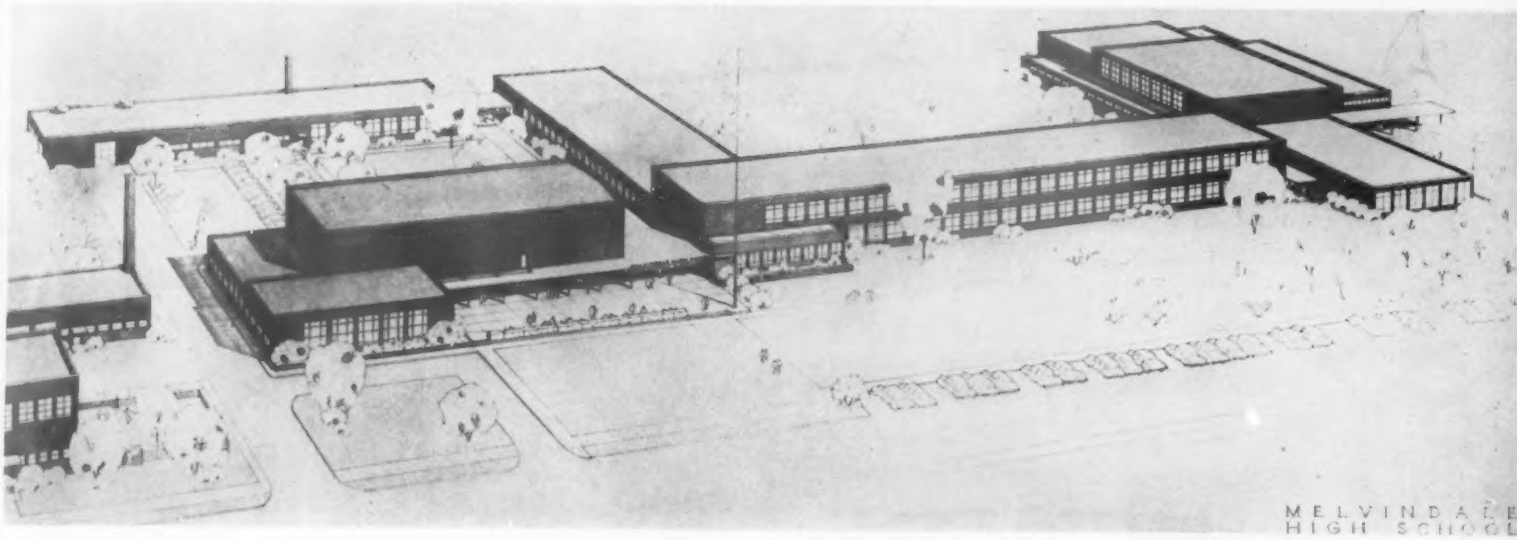
This section is planned to be continued in future editions.



Eberle M. Smith Associates

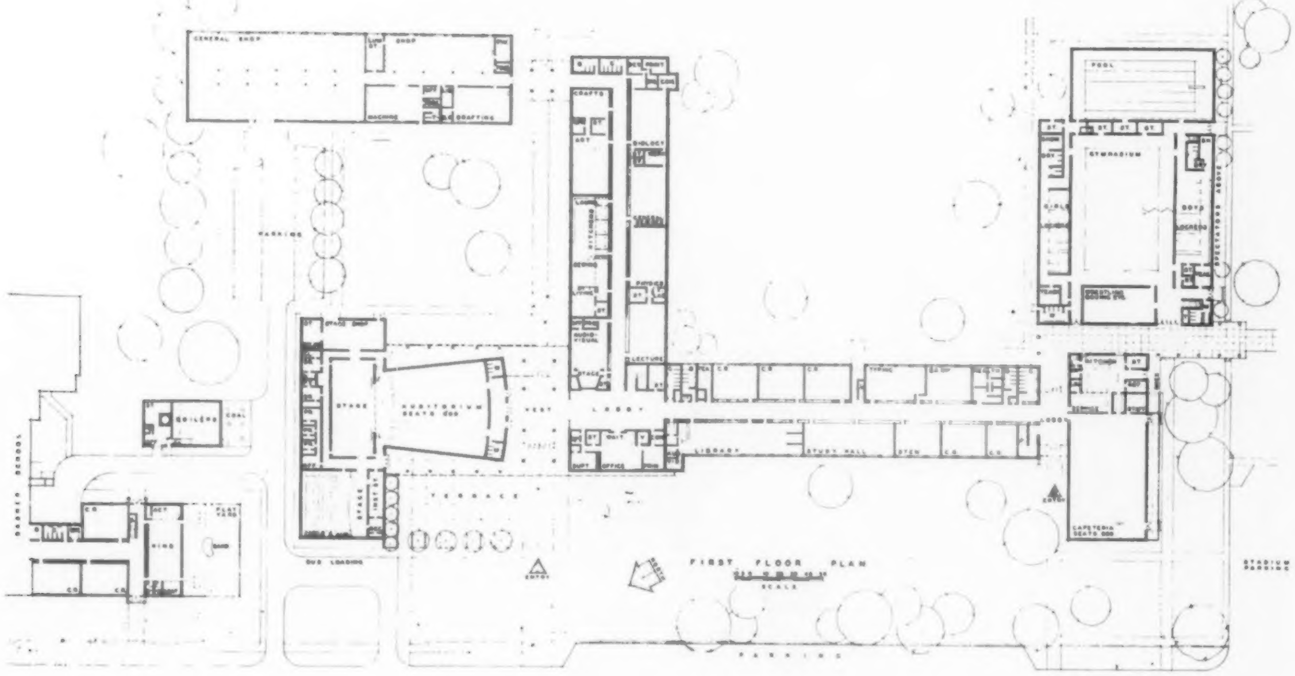
New Baltimore Grade and High School



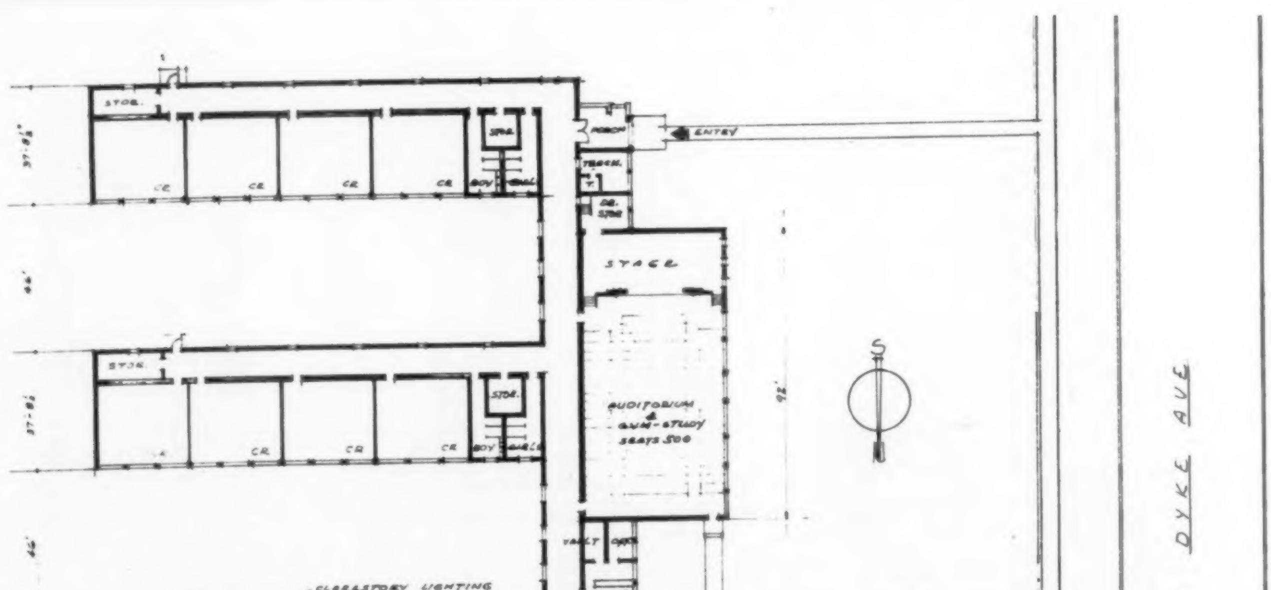


Eberle M. Smith Associates

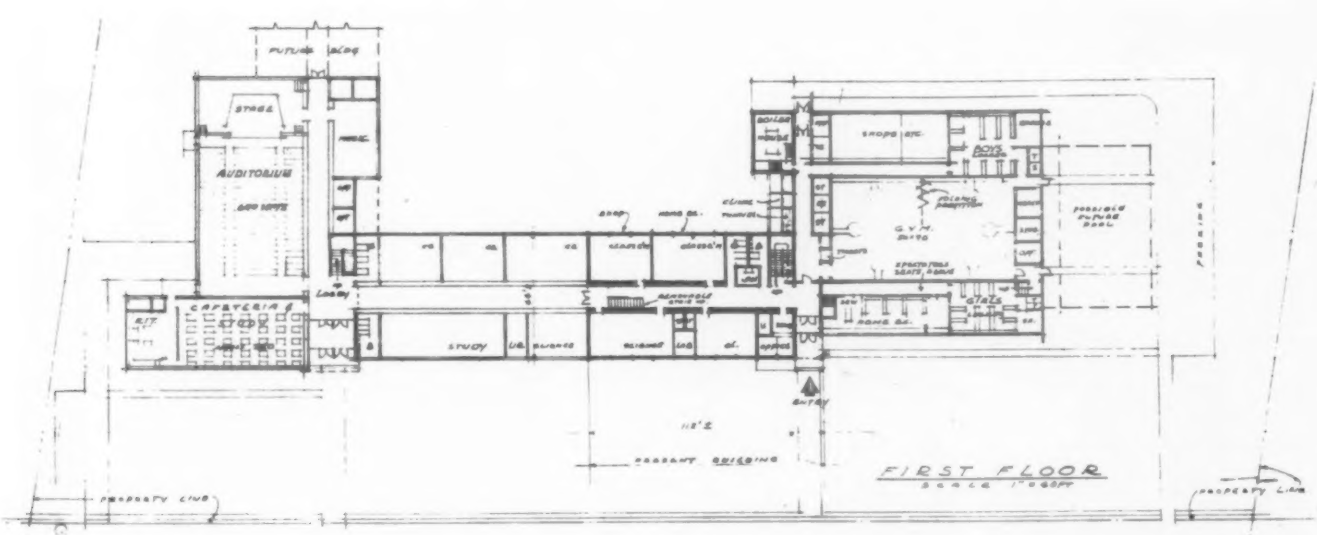
Melvindale High School

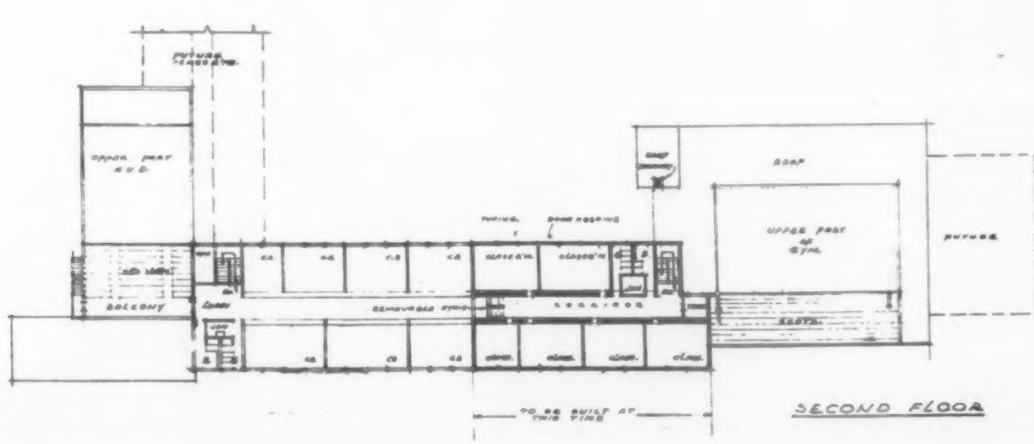


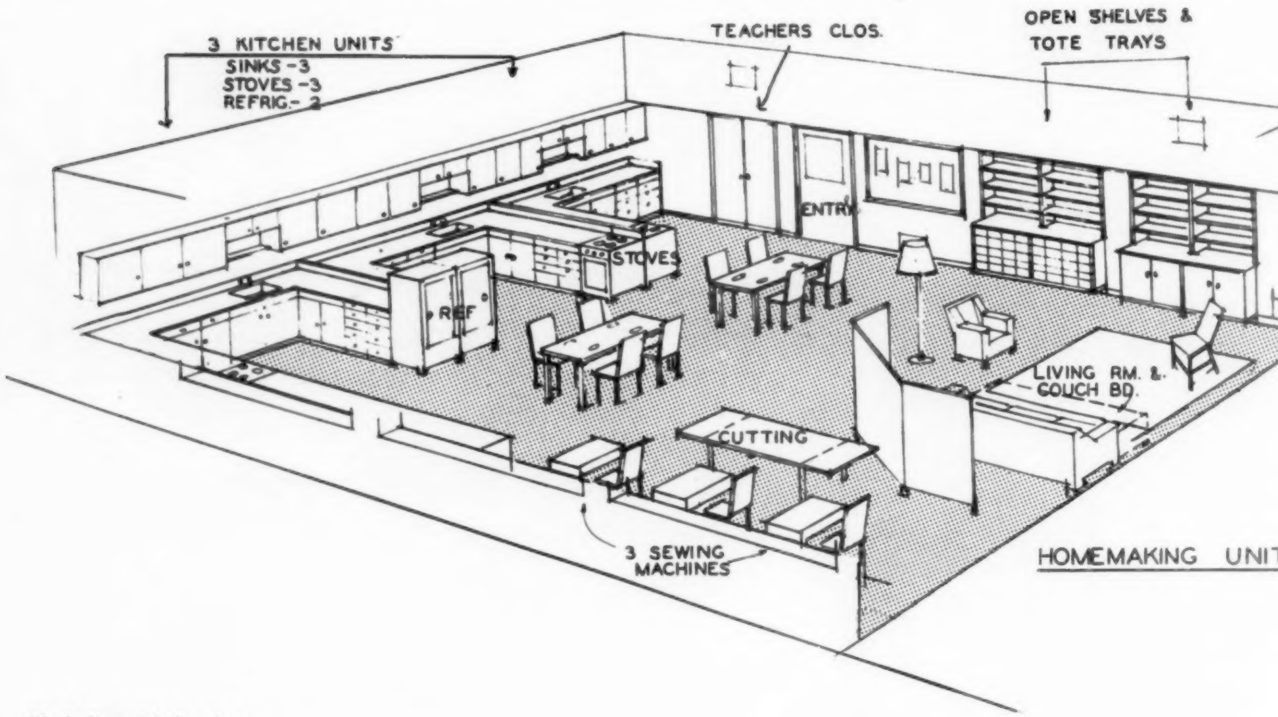

DISCO SCHOOL
D I S C O   S C H O O L


ENTRY
STAGE
AUDITORIUM & GYM-STUDY SEATS 500
CLERESTORY LIGHTING
KINDERGARTEN
OFFICE
ENTRANCE
FLOOR PLAN
VAN DYKE AVE
PARKING
PROPERTY LINES


GRATIOT HIGHSCHOOL
HIGHSCHOOL
FOR
GRATIOT TOWNSHIP
EBERLE M. SMITH ASSOC. INC.
ARCHITECTS — ENGINEERS


STAGE
AUDITORIUM
CAFETERIA
LOBBY
STUDY
G.Y.M.
ENTRY
PROPERTY LINE
FIRST FLOOR


BALCONY
FUTURE
SECOND FLOOR



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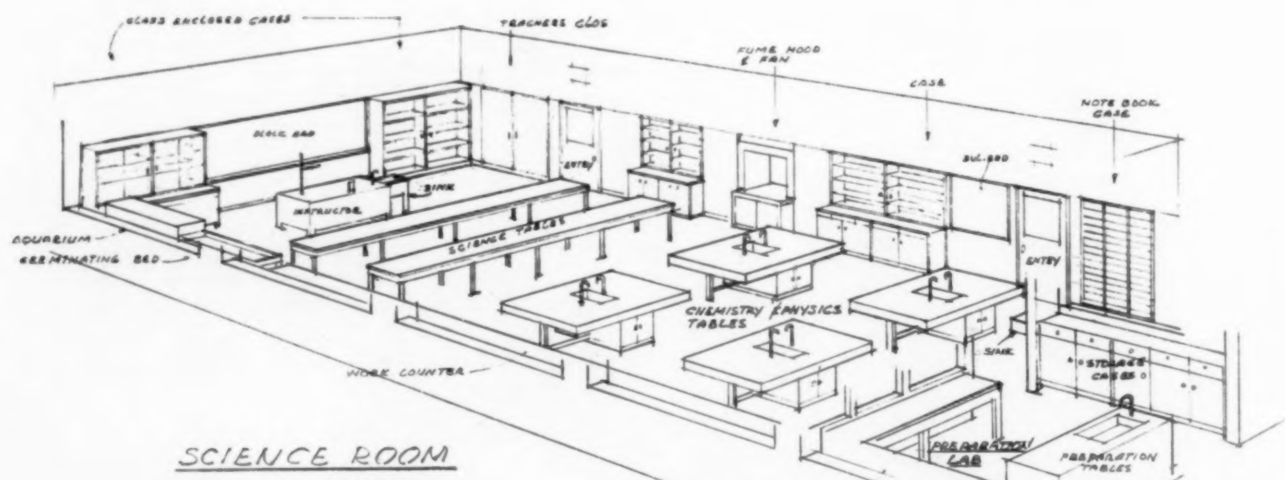
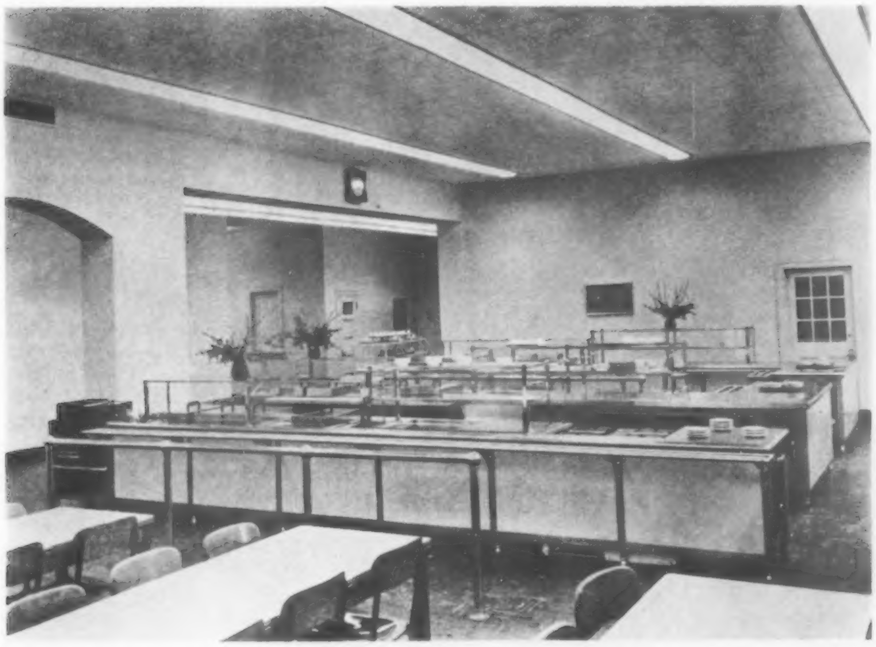


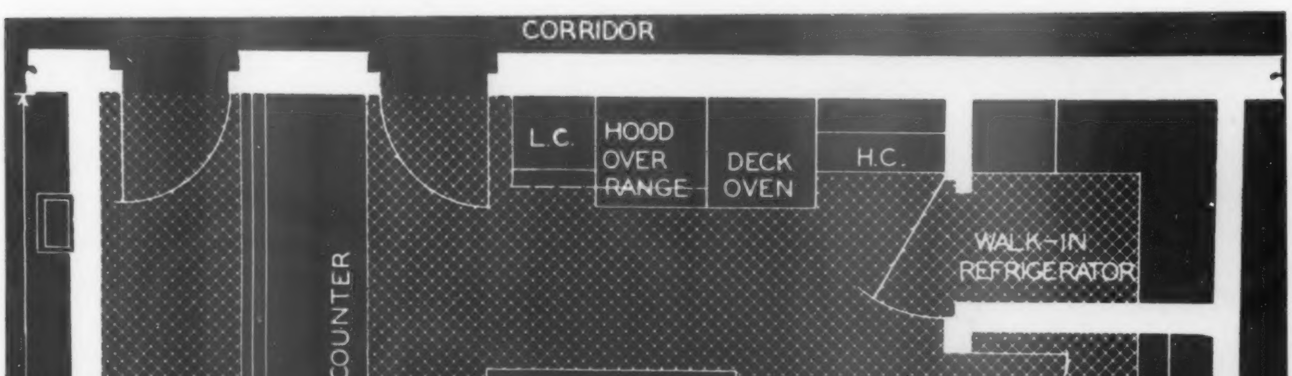
SCIENCE ROOM

- PHYSICS
- CHEMISTRY
- BIOLOGY
- GENERAL SCIENCE

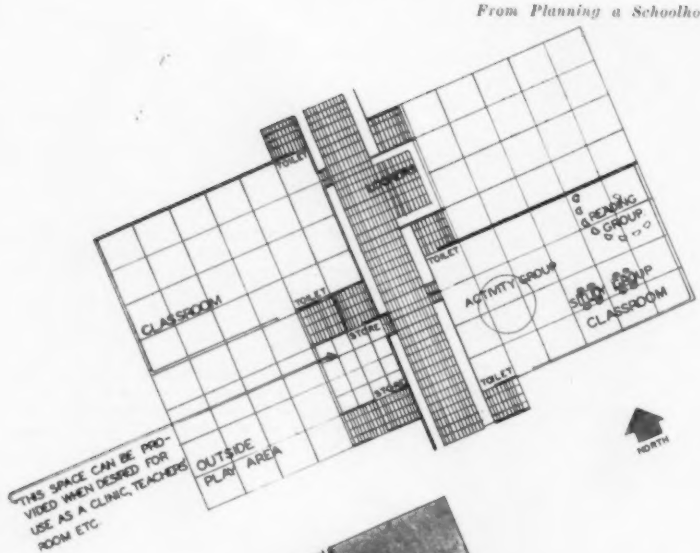


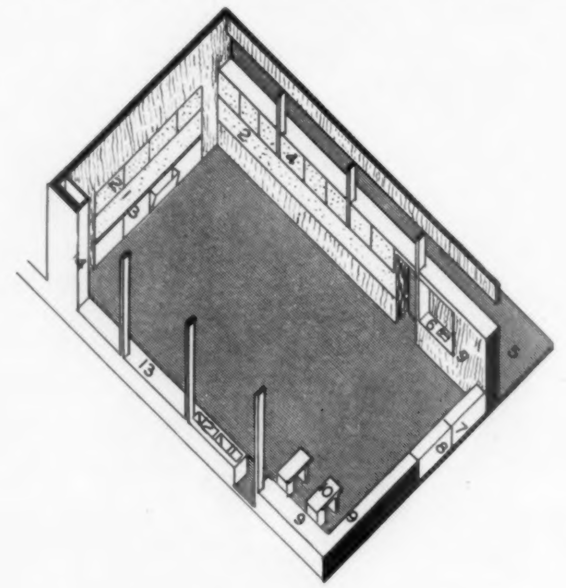
School cafeteria of Central High School, Newark, New Jersey, with recessed fluorescent lighting units by Holophane.

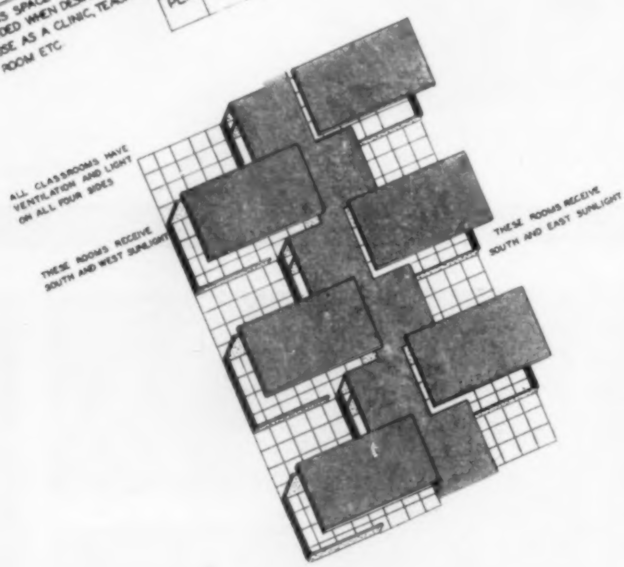
Below, school lunchroom kitchen for serving 500 children designed by the State Education Department of the University of the State of New York.



From Planning a Schoolhouse for Tomorrow's Citizens, by Harvard Graduate School of Education.





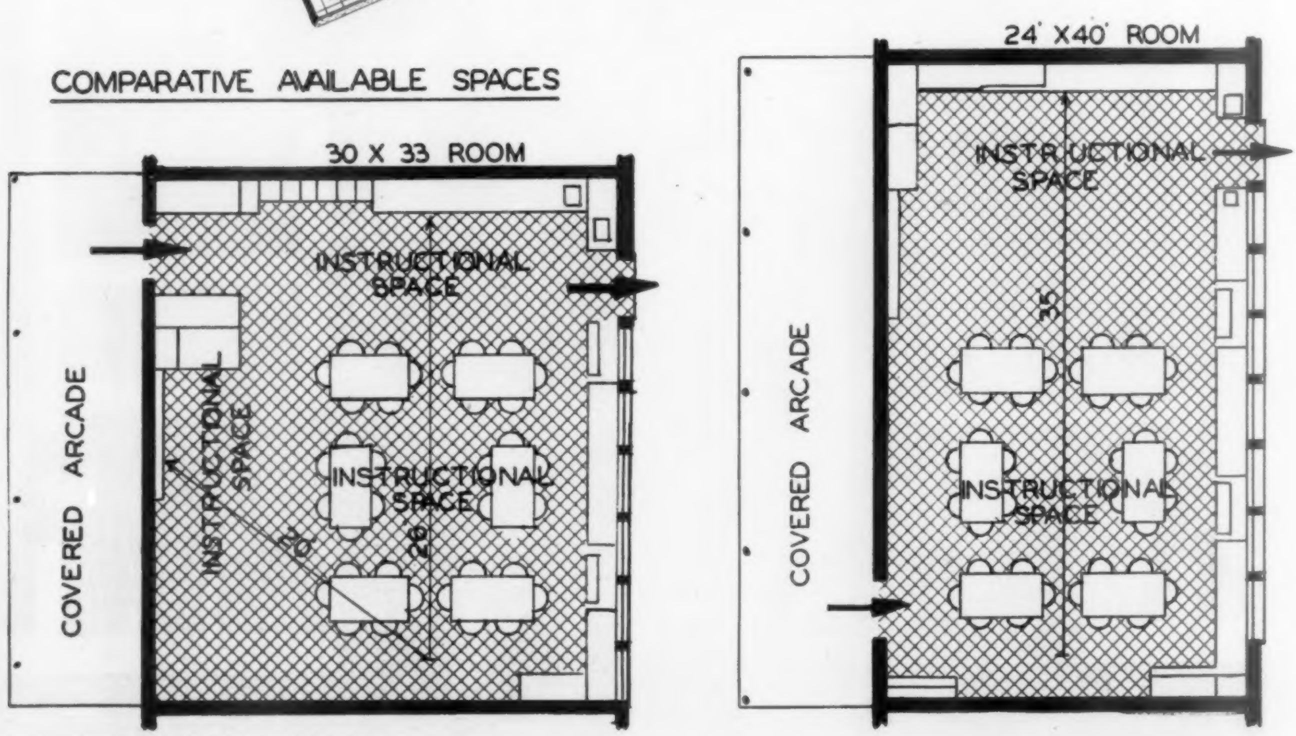


Suggested Elementary Classroom Designs

Above, the conventional type.

1. Blackboard
2. Tackspace
3. Chartcases
4. Cupboards
5. Lockers in Corridor
6. Sink and Bubbler
7. Clay truck
8. Tool truck
9. Store cupboards
10. Work benches
11. Aquarium
12. Exhibit case
13. Book shelves
14. Teacher's store

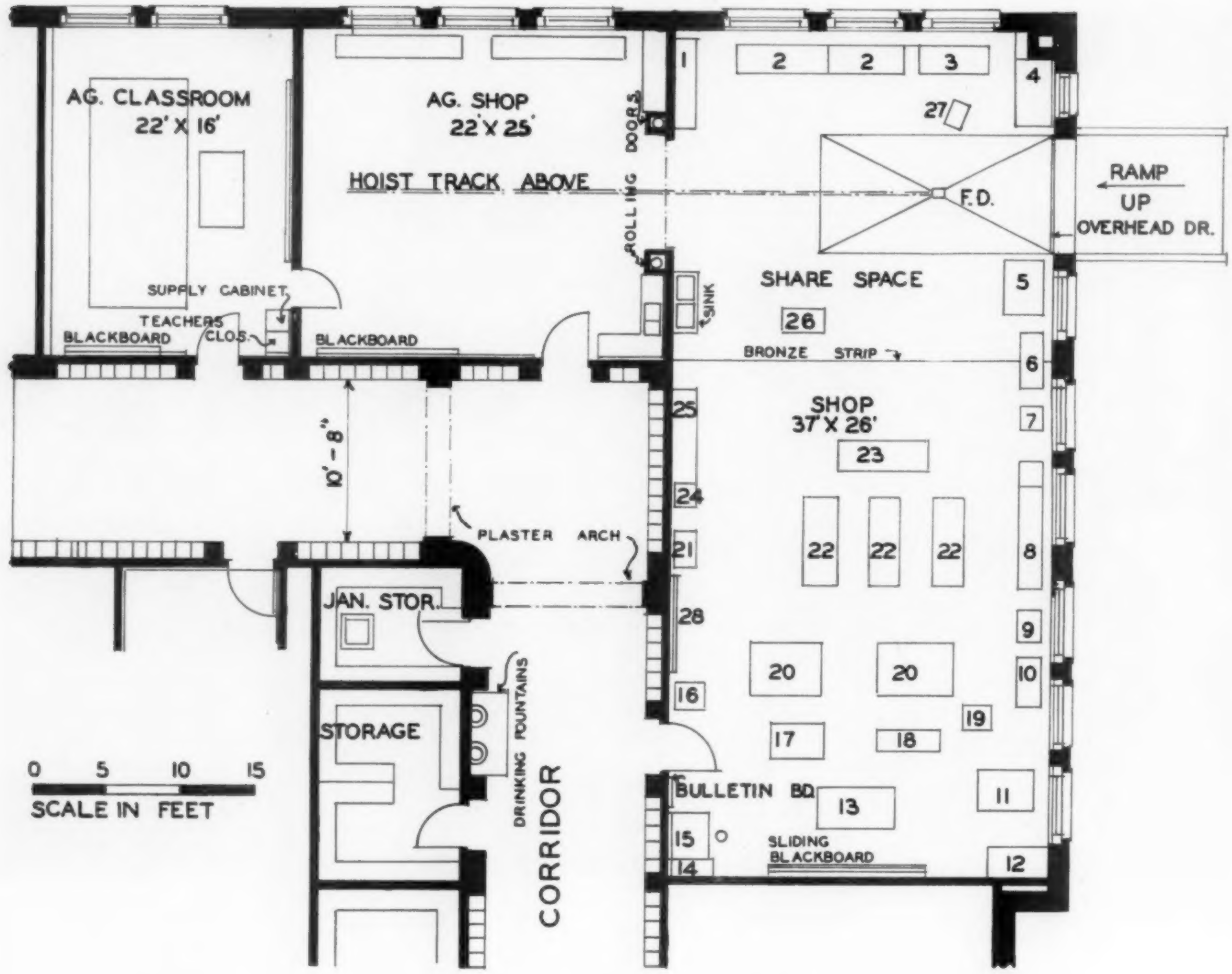
Below, the square versus the rectangle classroom. The square contains 990 square feet, three major instructional spaces. Distances are less, making for better supervision, better audibility, more flexible educational program, more free floor area, less wall. The rectangle contains 960 square feet, two major instructional spaces. Distances are greater, supervision and audibility poorer. The room is less flexible.



Courtesy Lewis J. Sarvis, Battle Creek, Michigan

Photos by Samuel H. Gottscho, Courtesy U. S. Office of Education

Classroom in Jamaica, New York, demonstrating modern demountable construction allowing for separate or all-in-one instructional areas, storage space, washroom. Bay window attracts morning and afternoon light.



AGRICULTURAL & INDUSTRIAL ART SHOPS

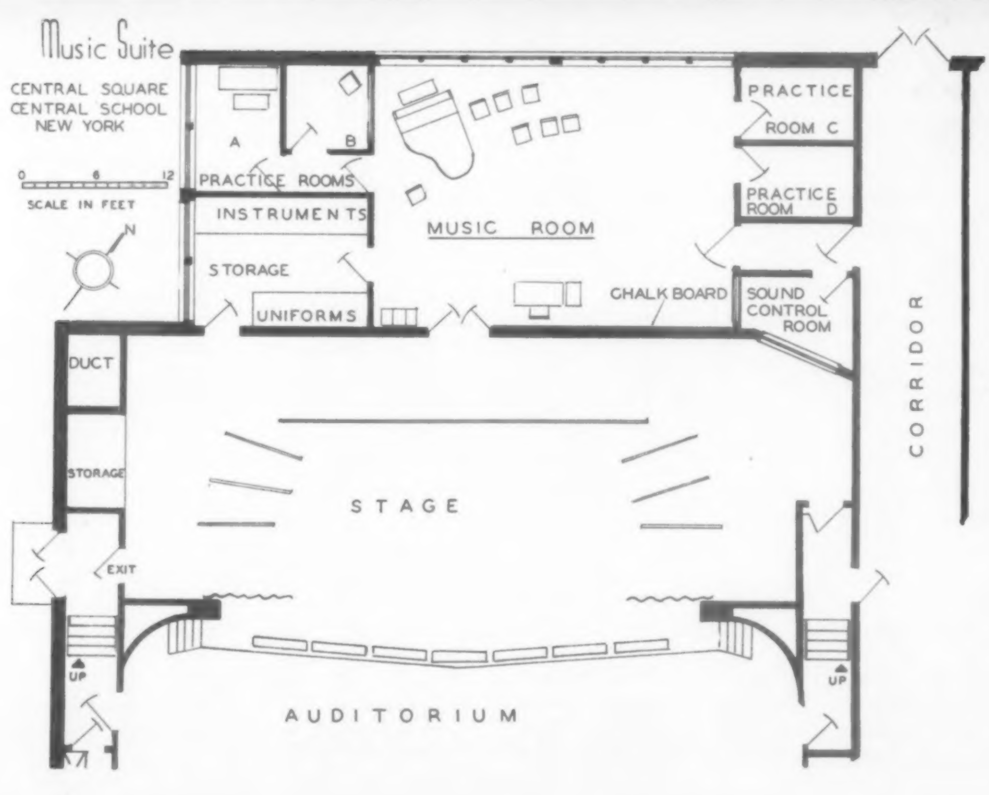
DEPOSIT CENTRAL SCHOOL DEPOSIT, N.Y.

A. F. Gilbert, Architect

Shop and Share Space Legend

1. Lumber rack
2. Finish bench
3. Gas furnace
4. Forge
5. Auto motor
6. Metal lathe
7. Drill press
8. Electric bench
9. Jig saw
10. Wood lathe
11. Type cabinet
12. Steel cabinet
13. Desk
14. File
15. Plan desk
16. Grinder
17. Double bench
18. Loom
19. Press table
20. Bench, wood
21. Pattern wheel
22. Machine bench
23. Sheet art metal bench
24. Kiln
25. Clay pottery
26. Circular saw
27. Anvil
28. Tool panel


MUSIC SUITE
CENTRAL SQUARE CENTRAL SCHOOL
CENTRAL SQUARE NEW YORK
SARGENT WEBSTER CRENSHAW & FOLLEY
ARCHITECTS A.I.A.


Music Suite
CENTRAL SQUARE
CENTRAL SCHOOL
NEW YORK
0 6 12
SCALE IN FEET
N
A
B
PRACTICE ROOMS
INSTRUMENTS
STORAGE
UNIFORMS
MUSIC ROOM
PRACTICE
ROOM C
PRACTICE
ROOM D
CHALK BOARD
SOUND
CONTROL
ROOM
CORRIDOR
DUCT
STORAGE
STAGE
EXIT
UP
UP
AUDITORIUM

EQUIPMENT LIST FOR NURSERY AND KINDERGARTEN

By CORRINE LIPCHIK

New York City

IN COMPILING the following lists of equipment, three different sources were used:

1. Those things required by law. All such items mentioned here have been italicized.
2. The type of equipment suggested by the authorities.
3. Suggestions from teachers engaged in work with pre-school children.

In dealing with certain pieces of equipment such as jungle gyms, slides, swings, etc., many types, sizes, and shapes made of various materials were found. Each fitted into a special type of play yard serving a certain number of children. There was no way of choosing any one item as desirable for all situations. Each school must select its own equipment to fulfill its particular needs.

Type of Building

Consider the climate, local conditions. Is a large indoor space more important for your weather conditions than a large outdoor playground?

A one-story building is usually preferable, because of the easy access to outdoor playgrounds.

Windows are important, for sunlight and for seeing out. (This means they should be placed low.)

PLAY ROOM

The floor is all-important, because the children will be spending much of their time on it.

Heating—must warm the floor.

Ventilation—must prevent drafts.

Floors—must be covered with a warm, easily cleaned stout material such as heavy linoleum, rubber or cork.

The space must be planned according to the size of the group of children. Fifteen 5-year-olds will need a good deal more than eight 2-year-olds. *New York State Department of Education requires a minimum of 20 square feet of indoor space and 200 square feet of outdoor space for each child under five.*

No specific list of furniture has ever been developed. Furniture should be selected:

a. To permit varied use of floor space for physical needs and activities, construction, dramatic play and the like.
b. To permit grouping of children for various activities.
c. To provide for the physical, social, and emotional development of children through
   (1) free movement
   (2) unhampered contacts
   (3) development of social responsibility and independence
   (4) efficient teacher-group relationship

Provision must be made not only for empty floor space, but for low open shelves for blocks, toys, books; there should be storage space for teachers' materials and for cots if they are set up in the playroom. There should be table space for each child, a chair for each, additional tables for special use. Individual lockers should be supplied to provide opportunity for each child to assume responsibility for the care of his own work, materials, and clothes. *A lighted room or compartment shall be provided sufficiently large and so arranged that a child's outer garments may be hung separately.*

Posture chairs with saddle seats
- 8″, 9″, 10″ from seat to floor—3 year olds
- 9″, 10″, 11″ from seat to floor—4 year olds
- 10″, 12″, 14″ from seat to floor—5 year olds

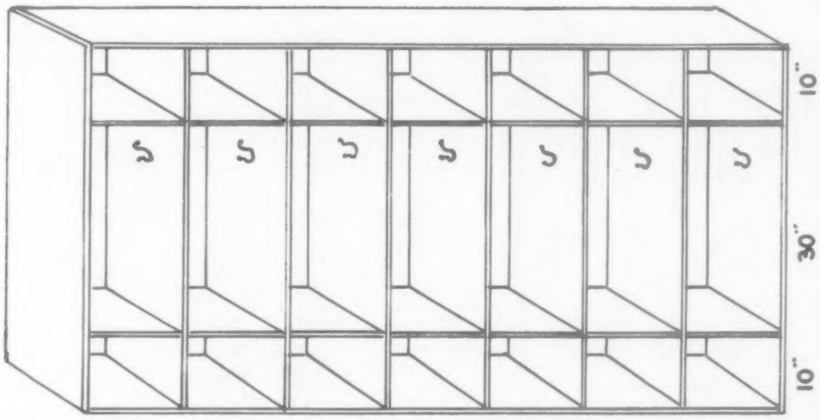
Oblong Tables—30″ x 60″
- 16″–18″ high for 3 year olds
- 18″–20″ high for 4 year olds
- 20″–22″ high for 5 year olds
- (min. of 9″ between chair and table top.)

Small round tables—for library or science

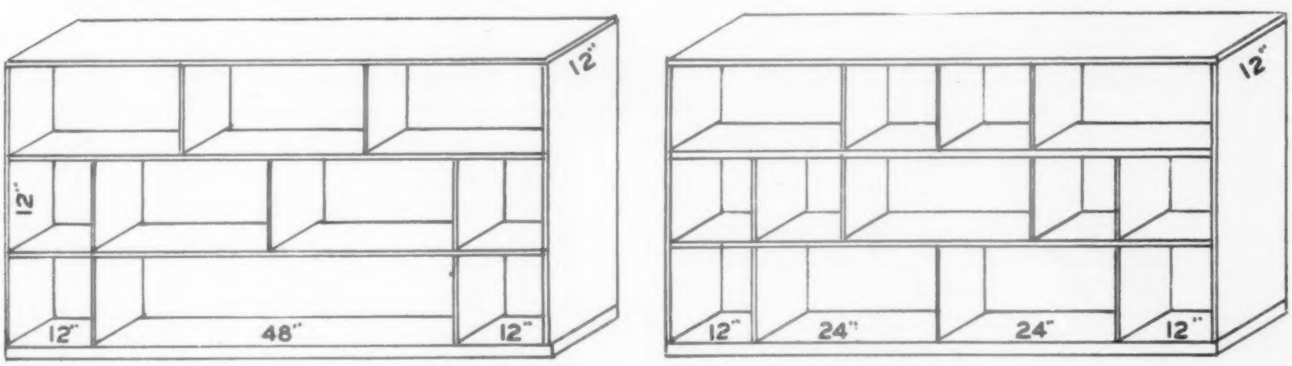
Piano

Phonograph-records
Wastepaper basket
Slop sink in playroom

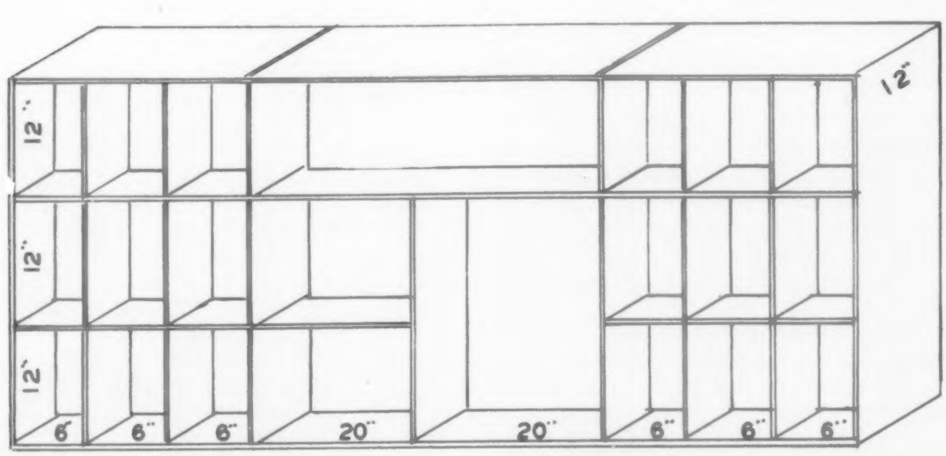
Shelving space—art supplies, materials, equipment
Lockers—individual—for clothes and work
Storage cubbyholes for teacher materials



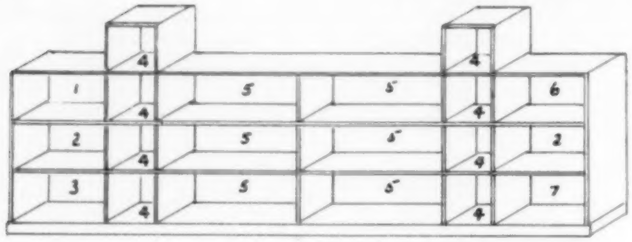
Individual lockers. Wood, ¾" for all but shelf space. Hooks, three in each locker, one on each side and at back.



Lockers for blocks and for supplementary materials.

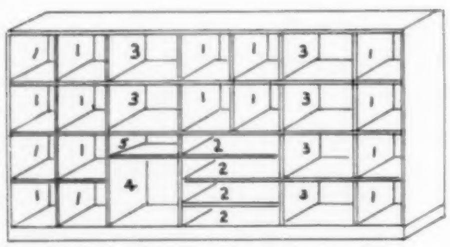


Individual cubbyholes for creative art supplies.



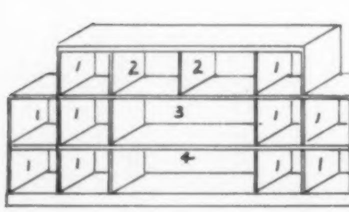
Extra shelf space.

1. Toy animals
2. Boxes filled with colored cubes
3. Toy automobiles
4. Small size blocks
5. Solid blocks
6. Dolls
7. Curved blocks



Shelf set for a larger class.

1. Individual crayon cubbies
2. Drawing paper and picture books
3. Puzzles and smaller materials
4. Clay jar
5. Squares of oilcloth for clay



Shelf set for a smaller class.

1. Individual crayon cubbyholes
2. Books
3. Drawing paper
4. Puzzles and small materials

Educational and Recreational equipment shall be clean, safe, and easily accessible to the children at all times. Such equipment shall be free from sharp, loose, or pointed parts and all paints used thereon shall be lead free. It shall include play materials appropriate to the stage of development of the children under care, and designed to foster physical and motor development and creative play.

Play areas must be arranged so that activities involving close work, such as painting, coloring, and looking at books, take place in the lightest part of the room; blocks and large equipment such as barrels and slides for rainy days, can be used in the larger areas where there is less light. An alcove for a noisy carpenter shop is advisable.

DOLL CORNER

Large doll bed—3′ x 2′
Tea table and chairs
Doll carriages
Ironing board, iron
Range
Refrigerator
Dishes—aluminum or plastic
Washboard, tub, clothespins, baskets
Rubber dolls
Old clothes for children
Trunk for doll clothes
Broom, mop, pans, dust cloth, etc.

Creative equipment

Paint easels
Clay crock, clay boards
Clay (wet modeling)
Sand
Paint (free from lead)
Paint brushes—large round, broad flat, ¼, ½

WORK SHOP

Workbench—20″ x 24″ high
Vises
Hammers (shoemaker—10, 12 oz.)
Crosscut saws—18″, 20″
Nails #14x1, #14x2, #15x1, #15x1½, #16x1
Lumber (soft) 36″ x 4″ x ½″, 36″ x 6″ x ½″, 36″ x 10″ x ½″, dowling, ¼, ½, 1.
Sandpaper (medium rough)
Glue, Wheels and substitute

Manipulative materials

Blocks (Prath Project Play Blocks)
Puzzles (wooden)
Trains (link) and wheeled
Boats
Animals and people (wooden)

BATHROOM

Must be directly adjacent to the playground and sleeping room as well as to the playroom.

Minimum of two toilets and basins for every thirty children

Toilets—10″-11″ above the floor
Washbowls—24″ above the floor

Soap and individual wash cloth and towels

Individual drinking cups, or one bubble fountain for every thirty children

Mirrors—28″ above the floor
Medical cabinet—out of the children's reach

SLEEPING ROOM

Needs direct sunlight during part of the day; ventilation that will avoid drafts on children's cots.

If the playroom is used for sleeping, ventilated storage closets should be provided for cots.

Cot for each child

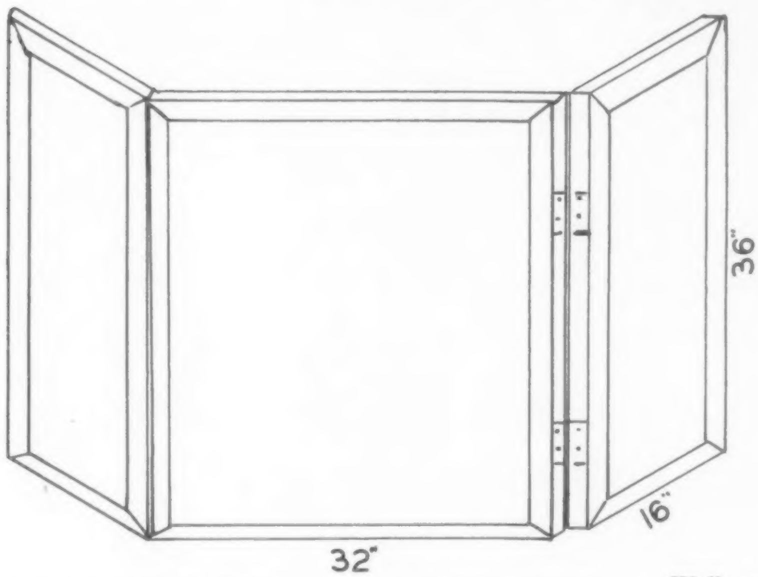
25″ x 52″—3, 4, and 5 year olds
25″ x 62″—oversized 5's

Blanket for each child

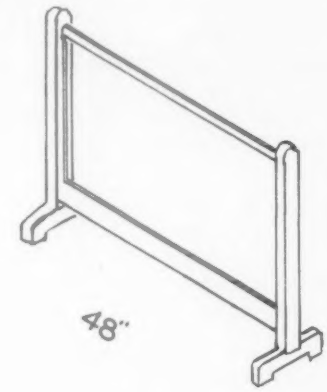
36″ x 54″—3, 4 year olds
36″ x 60″—5 year olds

Screens for each child

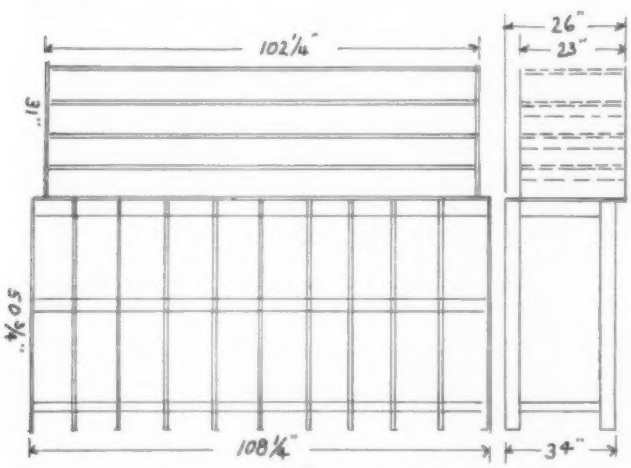
Sheets for each child—rubber sheeting to cover cots when necessary



Folding screen can be used to partition play areas, separate cots during rest, as a wall board, to hang pictures at children's eye level.



Bed screen (can double as a wall board).



Cot and bedding rack (carpenter-made). Pine wood boards approximately ¾" thick and 3" wide. Wider boards may be used to advantage.

Cot (carpenter-made). Oak wood is most durable though heavier. May use spruce, fir, or yellow pine.
Frame-sides 1⅝" x 1¾" x 4'. In joining corners, fasten with corrugated fasteners. Reinforce with corner angles, 3" x 3" on the bottom edges.
Legs ¾" x 1¾" x 10", top ends rounded so as not to tear canvas when folding under. Bottom end cut on slope to fit floor. Secured to cot with carriage bolts 5/16" x 3" and washer between leg and frame. Bolt set 1⅞" from end of frame. Leg should project about 1¼" beyond end of cot. Leg braces ¾" x 1¾" x 1' 9" secured to leg with screws.
Canvas 10 oz. 1½ yds. 29" wide, preshrunk, stretched smoothly and tacked to bottom edge of frame. May be cut at corner on diagonal and folded under to avoid corner fold if desired.

KITCHEN

Well ventilated, walls and floors easily cleaned
Storage place for:
1. Kitchen utensils
2. Groceries
3. Equipment
   Stove (at least one oven)
   Refrigerator
   Tables—tops easily cleaned
   working height 36"–38"
   24" x 36"
   Adult chairs
   Garbage cans
   Serving trays and trucks

ROOM FOR INSPECTION

This should be located as near the entrance as possible to insure the child's having no group contacts before he passes inspection.

Isolation room—*A properly ventilated space acceptable to the Department of Health shall be available for the temporary isolation of any child having symptoms of sickness, pending proper disposition of the case*

First aid—*Approved Red Cross first-aid kit*

OBSERVATION BOOTH

For parent, student, and other visitors, an excellent arrangement is provided by the use of the double screen. Visitors inside the darkened booth can see into the playroom clearly, but cannot be seen by the children.

ADMINISTRATIVE REQUIREMENTS

Reception space
Office space
Storage space for reserve materials
Clock space, toilet, and rest room for staff
Broom closets, slop sinks—custodial care

PLAYGROUND

A safe and sanitary outdoor play space shall be available.

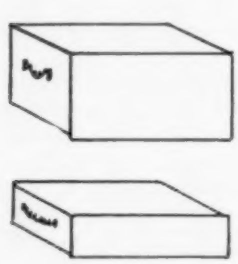
Important:

Close access to the nursery room and bathroom.
Three kinds of exposure: direct sun, shade, and, if possible, a covered play space.

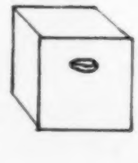
Enclosed, away from the street, partitioned areas for the various ages.
A cement section for wheel toys (and dry feet).
Natural trees for climbing, and shade if possible.
Adjacent *storage space* for materials that cannot be left out in the weather.

Apparatus for climbing, swinging, hanging, pulling, and pushing insures opportunity for free, vigorous activity for development of the lungs and the large fundamental muscles of arms, shoulders, chest, legs, and back, such as:

Swings
Horizontal bars
Rings
Swinging rope ladder
Jungle gym
Slides
Seesaws
Carts, wagons
Tricycles
Buckets, washtubs
Rope, balls (all sizes)
Equipment for building, piling, and digging
Garden tools, such as rakes and shovels
Covered sand box or digging hole and tools, such as sieves, smooth-edged cans, wooden spoons, pails.
Blocks—three kinds—large drag blocks, hollow box blocks, building blocks.
Hollow Kegs
Saw Horses
Play boards 5½″ x 3′ x ¾″
5½″ x 3′ x ¾″
Three walking boards 15′ x 8′ x ⅞″ thick

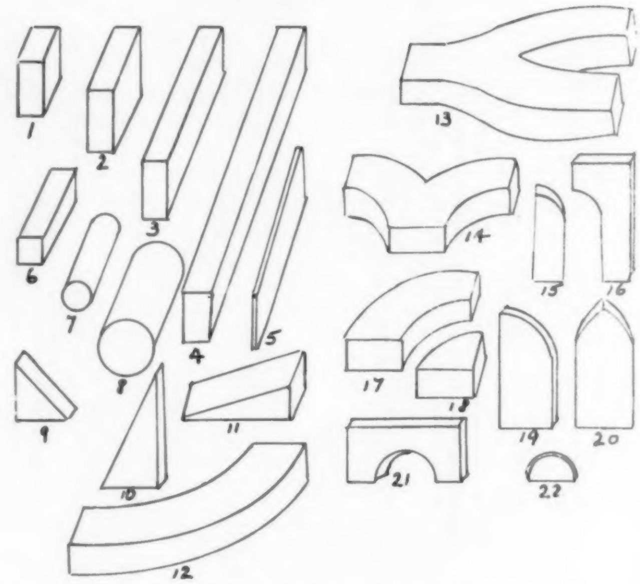


Drag blocks (carpenter-made). Wood—¾″ pine. Handles — rope run through two holes bored in each end and knotted on inside before cover is nailed on.



Hollow blocks (carpenter-made). Wood—½″ or ¾″ poplar stock. Other sizes, 6″ x 6″ x 18″, 6″ x 12″ x 18″, 6″ x 12″ x 12″.

Push wagon (carpenter-made). Board—20″ x 15″ x 1″ reinforced at both ends. Castors—Ballbearing with iron plate adjusted by four screws. Handle—curved iron pipe.



In this group of blocks, 1 is the unit upon which 2, 3, 4, 5, and 6 are planned. 2, 3, and 4 are multiple lengths of 1, while 5 and 6 are multiple width and lengths. 9, 10, and 11 are diagonally cut halves of 1 and 2. The necessary number of each kind of blocks will vary with the number of children in a group. For a group of 20 to 25 children, the following numbers are suggested: 60 of Diagram 1; 100 of Diagram 2, 3; 60 of Diagram 4, 5, 6; 20 of Diagram 7, 8, 9, 10, 11; 12 of Diagram 12; 12 of each of the others.

Prath Project Play Blocks

No.	Name	Size	Net. Wt.
1	Half Unit	2¾ x 2¾	4 oz.
2	Unit	2¾ x 5½	7 oz.
3	Double Unit	2¾ x 11	13 oz.
4	Quadruple Unit	2¾ x 22	26 oz.
5	Roof Board	2¾ x 11 x 11/32	2 oz.
6	Pillar	1⅜ x 5½	3 oz.
7	Small Cylinder	1⅜ x 5½	4 oz.
8	Large Cylinder	2¾ x 5½	11 oz.
9	Small Triangle	2¾ x 2¾	2 oz.
10	Large Triangle	2¾ x 5½	4 oz.
11	Ramp	2¾ x 5½	3 oz.
12	Ell'ptical Curve	2¾ x 13½	13 oz.
13	Y Switch	8¼ x 11	21 oz.
14	Right Angle Switch	5½ x 8	10 oz.
15	Small Buttress	1⅜ x 4⅛	3 oz.
16	Half Gothic Arch	2¾ x 5½	4 oz.
17	Circular Curve	2¾ x 8	7 oz.
18	Quarter Circle	2¾ x 2¾	3 oz.
19	Large Buttress	2¾ x 5½	6 oz.
20	Gothic Door	2¾ x 5½	5 oz.
21	Circular Arch	2¾ x 5½	5 oz.
22	Half Circle	2¾ x 1⅜	2 oz.

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A LIST OF EQUIPMENT FOR CLASSROOMS IN A MODERN ELEMENTARY SCHOOL

By ARCHIBALD B. SHAW

Assistant Superintendant of Schools, Scarsdale, New York

BASED upon lists gathered by committees of teachers and principals in the Scarsdale elementary schools from their evaluation of present equipment and felt needs.

Equipment listed includes certain aspects of the building itself which immediately affect the classroom situation, as well as all material which is defined under New York State accounting practice as "Equipment" as distinguished from "Supplies."

There is no definition of the classroom—it may be, and almost inevitably will be, a suite of rooms in the lower grades. However, especially in the middle and upper grades, the room is affected definitely by what other facilities are available in the building—an arts and crafts room for example, reduces the demand for such equipment within the classroom. The general feeling, also, is that except for toilet separation in the kindergarten to second grade rooms, most alcove or cloak-room type of separation should be by movable cabinets of such a height as to lend themselves to easy supervision by the teacher, and of such a nature as to make possible day-to-day, or at least month-to-month flexibility in those spaces.

The list does not cover highly essential facilities, and some mootly desirable ones, as:

Library—with science resource (museum-lab), audio-visual storage-workshop, reference, reading, story-telling facilities
Health Suite
Offices—secretarial, principal's
Staff rooms—work, rest, committee, toilet (perhaps with male rest and toilet rooms shared with custodians)
Play room—and auditorium, if community need indicates
Playground Equipment
Lunch-room
Bicycle storage
Custodians' workshop and storage
Service rooms of all sorts, from book closets to coal bins
Instrumental music rooms
Remedial room
Visual education room, shop, art, parents' rooms, etc.

Kindergarten

I. INDOORS—BUILT-IN

Closet space and cupboard space to permit efficient storage of equipment, materials, and supplies
Open shelves for blocks, toys, children's books
Built-in filing case
Storage for rest rugs or cots
Individual lockers (or cupboards) for children's work (25)
Bulletin boards—two 4′ x 8′ or equivalent
Chalk board—one 4′ x 4′
Fireplace with low mantel, screen and accessories
Work-sink—low and large enough for boat-sailing as well as washing paint pots, watering flowers, etc.
Indirect lighting fixtures
Venetian blinds, or light-diffusing shades (center-mounted)
Drapes, or dark shades—for rest periods
Washable, resilient, reasonably warm floor (linoleum)
All finish light—none glossy
House telephone
Two wall electric receptacles
Direct access to out-of-doors
Ventilated coat cabinets or lockers for wraps—25 individual, with two hooks, hat-shelf, rubber-shelf
2 flush-bowls, sized for five-year-olds
2 low, deep sinks—*warm* and cold water, faucets that are not self-closing
Drinking fountain

Soap dispenser
Paper towel container
Mirror—low enough for five-year-olds

II. FURNITURE—all of light finish, very sturdy construction, equipped with good dome glides.

Tables—6-8 oblong, wood, 24″ x 48″, 21″ high
Tables—1-2 round or hexagonal, wood, 21″ high, 36″-40″ diameter
Chairs—25, 11″-12″ high (half of each)
Teacher's desk—50″ x 30″ x 30″
Chairs—3 for teacher and visitors
2-3 low (36″) portable screen-bulletin boards
1-2 extra tables for display and work—linoleum-topped
Clock with *arabic* numerals
Pencil sharpener
Window pole
United States Flag, mounted
2 waste baskets

III. WORK AND PLAY EQUIPMENT

A. *Science and Nature Study*
Gardening tools—rakes, hoe, spade, trowels, watering can
Aquarium
Pet cage
Prisms
Large thermometer
Magnets
Hour glass
Magnifying glass
Terrarium, or small greenhouse

B. *Dramatic Play*
Doll house and set of doll furniture
Doll carriage, doll bed
Boy doll, girl doll, baby doll
Set of furniture large enough for children to use—dishes, cooking, washing and ironing, broom
Toy telephone
Rocking chair—child-size
Costumes—or dress-up clothes
Story-telling toys—as aid to dramatics
Small floor brush, and floor mop
3 trays for use at lunch time
Sand table with cover
Moulds, wooden spoons, pails, sieves, etc., for sand table
1 set Project Blocks
1 set Patty Hill, or Fox Blocks
1 set hollow outdoor blocks
Miscellaneous floor toys of sturdy wooden construction — trains, boats, planes, trucks, carts, animals, people

C. *Art*
2 double easels—with linoleum mat underneath
2 doz. blunt good grade scissors
12-15 clay boards
Clay jar
Paper punch, stapler
Yardstick, rulers
Paint jars, paper cutter
1 pair shears

D. *Puzzles and Games*
A number of large inset puzzles, assorted subjects
A number of large cut puzzles, mounted on wood
Large wooden beads and pegs
Simple games (lotto, ring toss, etc.)

E. *Health and Physical Development*—indoors exercise mat

F. *Music and Rhythms*
Small, easily moved piano and bench
Variety of music books
Electric record player, and record file
Good collection of appropriate records—mostly in central record library, where there is more than one kindergarten
Rhythm instruments—tamborines, drum, tom-tom, clappers, triangle, bells

G. *Reading Readiness and Number Concept Materials*
Anagrams
Wooden ABC letters
ABC picture board
Rubber stamping set
Plastic numbers
Clock dial and clock puzzle
Cash register, and toy money
Height panel

H. *Library*
Access to school library
Permanent room collection of Mother Goose, 10-cent-store books, linen picture books, classic folk-tales, poetry anthologies

I. *Pictures*
A good collection of prints which may be changed according to children's interests. Such pictures as Cizek's Japanese and Chinese animal prints; Rosa Bonheur's horses; and the like.

J. *Rest*
Cots if possible, and ample storage for them
Beach rolls, or mats of uniform size, if no cots

K. *Woodworking*
Work bench 24″ high with extra vises
3 hammers of medium weight
3 small crosscut saws—good quality
Screwdriver, rasp, pliers
Wall rack for tools
Storage rack for wood (mill-ends, dowels, etc.)

IV. OUTDOORS

Apparatus—slide, jungle gym, swings
Coverable sand box, good size
Playhouse—which will serve as storage for the following additional equipment:
Saw horses, kegs
Packing cases, crates
Large hollow blocks
Balls, jump ropes, hoops
Tricycle
Wagons
Wheel barrow
Walking and balancing boards
Push cart

V. EQUIPMENT TO BE SHARED WITH OTHER GROUPS

Hand sewing machine
Large sewing machine
Pinking shears
Large paper cutter
Insect cages
Exhibit cases
Globe
Pressing-Iron
Typewriter with primer type face
Electric kiln

Grades I and II

I. INDOORS—BUILT-IN

Closet space and cupboard space to permit efficient storage of equipment, materials, and supplies
Open shelves for blocks, toys, children's books
Built-in filing case
Individual lockers (or cupboards) for children's work (25)
Bulletin boards—48″ high, 12′ to 16′
Chalk boards—48″ high, 8′ to 12′ (may be interchanged with the bulletin boards)
Work sink—low, washing paint jars, etc.
Indirect lighting fixtures
Venetian blinds, of light-diffusing shades (center-mounted)
Washable, resilient, reasonably warm floor (linoleum)
All finish light, none glossy
House telephone
Two wall electric receptacles
Direct access to out-of-doors
Ventilated coat cabinets or lockers for outer wraps—25 individual, with 2 hooks, hat shelf, rubber shelf
2 flush bowls, slightly lower than adult
2 low, deep sinks—*warm* and cold water, faucets that are *not* self-closing
Drinking fountain
Soap dispenser
Paper towel container
Mirror—low enough for six and seven-year olds

II. FURNITURE—all of light finish, sturdy construction, equipped with good dome glides

Desks, pupil — movable table-type (adjustable height, if they are obtainable), 25
Chairs—30, three heights per room
Teacher's desk—50″ x 30″ x 30″
Chairs ("side")—3 for teacher and visitors
1-2 low (36″) portable screen-bulletin boards
2 round or hexagonal tables 23″ high, 36-40″ diameter
Work and display table 30″ high, 24″ x 40″-50″
Clock with *arabic* numerals
Pencil sharpener
Window pole
United States Flag, mounted (2′ x 3′)
2 waste baskets

III. WORK AND PLAY EQUIPMENT

A. *Science and Nature Study*
Watering can
Aquarium
Thermometer—mounted inside, low
Thermometer—mounted outside the window
Magnets
Magnifying glass
Terrarium
Pots and boxes for planting

B. *Dramatic Play*
Doll furniture — bed, carriage, chest, stove, chairs, cupboard, utensils, phone, dishes, etc.
Dolls—boy, girl, baby
Costume chest
Broom and dust pan
1 set of blocks—Pratt, Fox, Hollow, to be exchanged from room to room in first grade Pratt blocks alone swapped in grade 2
Floor toys—harbor, farm, airplanes, humans, etc.

C. *Art*
2 double easels with linoleum mats beneath
25 semi-blunt scissors
1 pr. large shears
1 paper cutter, small
12 clay boards
Clay can
18 paint jars
yardstick
rulers—25
paper punch
stapler
sewing kit

D. *Puzzles and Games*, as for example—
Animal and bird lotto, ring toss, bean bags
Dominoes, jig-saw puzzles, balls
Anagrams, wooden alphabets, printing set

E. *Health and Physical Development*—indoors
Exercise mat

F. *Music and Rhythms*
Electric record player, and record file

G. *Library*
Access to school library
Permanent room collection of primers, children's stories, and picture books, etc.

H. *Woodworking*
Tool rack
Wood storage chest or rack
Work bench with extra vises
5 hammers, 3 saws, 2 screwdrivers, rasp, brace and bits

IV. EQUIPMENT TO BE SHARED WITH OTHER GROUPS

Light, movable piano and bench
Rhythm instruments
Records
Animal cages
Garden tools
Sand tables
Sand toys
Pictures and bracquette frames
Pinking shears
Sewing machine
Large paper cutter

Hot plates
Electric kiln
1 set of 25 cots
Typewriter with primer keyboard

Grades III and IV

I. INDOORS—BUILT-IN

Closet space and cupboard space to permit efficient storage of equipment, materials, and supplies
Open shelves for books and display
Built-in filing case
Individual lockers or cupboards for children's work—25
Bulletin boards and chalkboards, interchangeable 12′–16′ x 4′
Bulletin board—map board to ceiling, 16′—for large maps
Work sink—low, for washing paint jars, etc.
Paper towel container
Soap dispenser
Drinking fountain
Indirect lighting fixtures
Light-diffusing shades, center-mounted
All finish light, none glossy
House telephone
Two wall electric receptacles
Ventilated coat cabinets or lockers for outer wraps —25 individual, with 2 hooks, hat-shelf, rubber-shelf

II. FURNITURE—of light finish, sturdy construction, equipped with good dome glides

Desks, pupil—movable table-type (adjustable height, if such are obtainable)—25
Chairs—30, three heights per room
Teacher's desk—50″ x 30″ x 30″
Chairs ("side")—3 for teacher and visitors
1 portable screen-bulletin board
Work and display table 30″ x 24″ x 40″–50″
Two easels, with mats underneath
Radio-phonograph, and record file
Work bench with extra vises
Wood storage chest or rack
Tool rack
Clock with *Roman* numerals
Pencil sharpener
Window pole
United States Flag, mounted (2′ x 3′)
2 waste baskets

III. WORK AND PLAY EQUIPMENT

Atlas
Books—texts, reference, free-reading
Compasses—1 chalk, 6 pencil
Dictionary on stand
Dustpan and brush
Erasers, chalkboard
Games (rainy day)
Globes—with stands—political 16″, outline 24″
Inkwells for each desk
Line marker
Maps—suitably cased and hung
Paper punch
Pointer
Play—baseballs, soccer, footballs, etc.
Rulers—25
Scissors—25 semi-blunt
Shears—large—1
Screen—beaded, in case on spring roller
Thermometer—inside, 30″ from floor outside window
Tools—hammers, saws, squares, screwdrivers, rasp, pliers, brace and bits
Watering can
Yardstick

IV. EQUIPMENT TO BE SHARED WITH OTHER GROUPS

Aquarium
Bulletin-chalkboard, movable
Building games—(erector, constructor)
Cabinets and cases for collections and display
Cages for pets
Clay jars
Easel, large
Electric iron
Electric kiln
Encyclopedia
Extension cords
Films, film strips, slides
Glove outline, 24″
Gardening tools—several sets
Light meter
Measures—dry and liquid
Planetarium
Paper cutters—several sizes
Projectors—16mm sound, slide, picturol, balopticon
Puppet-show stage
Shadow-screen and full length mirror
Sewing machine
Standard list of science equipment
Stylus and stencil set
Terrarium
Typewriter
Voice recorder
Window-boxes, flower pots, vases
Nearby toilets

Grades V and VI

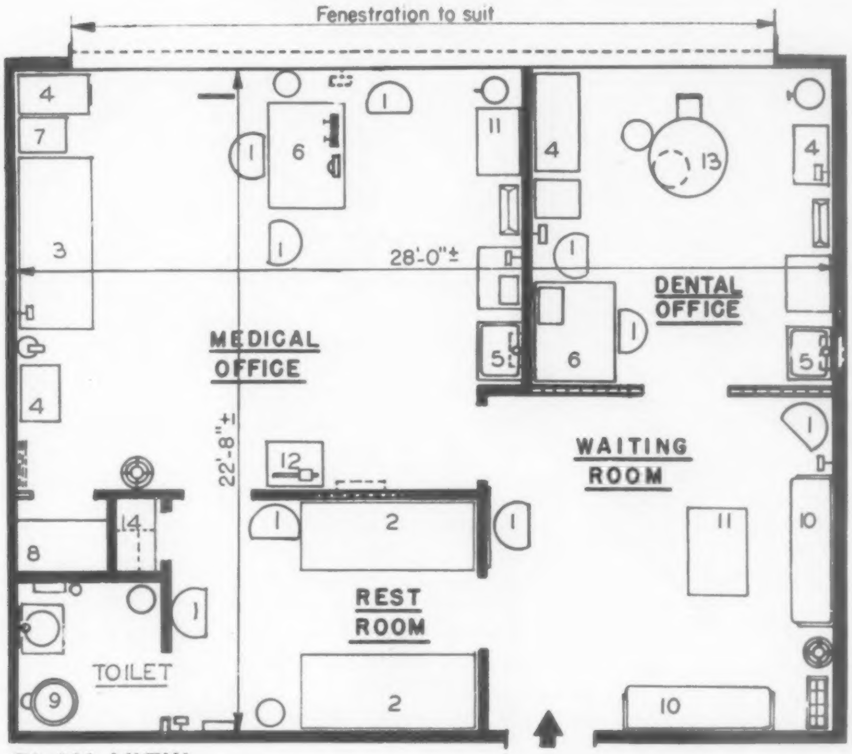
I. INDOORS—BUILT-IN

See Grades III & IV—add etching of 1-inch squares on one 4 x 4′ chalkboard

II. FURNITURE
See Grades III & IV—add magazine rack

III. WORK AND PLAY EQUIPMENT
See Grades III & IV—encyclopedia in each room

IV. EQUIPMENT TO BE SHARED
See Grades III & IV



PLAN VIEW

1. Chair
2. Cot
3. Couch
4. Cabinet
5. Sink
6. Desk
7. Locker
8. Closet
9. Water closet—silent flush
10. Settee
11. Table
12. Scale
13. Dental chair
14. Shelves

From Manual of School Planning, New York City Board of Education

THE HEALTH SUITE

By URSULA M. MORAN

New York City Schools

THE location of special facilities, rooms, and equipment should be given careful attention from the point of view of those who make use of them and for efficient administration. Thus, library, auditorium, lunchroom, the health suite, and gymnasium or recreation room should be readily accessible to the entire school. The building site itself should be large enough in area to provide for outdoor physical education and recreation for the pupil population and the adults of the community.

Medical examinations are under the jurisdiction and supervision of the chairman of Health Education in the junior and senior high schools. Having these units adjacent to the gymnasium makes it possible to use health records when prescribing special work to be done in the gymnasium units.

The Health Suite is provided in the interest of the health and well being of the entire school personnel. Periodic physical examinations, diagnosis, recommendations for remedial measures, and emergency treatment are the more important medical services provided by the unit. The inclusion of a dental unit as part of the health suite may be dependent upon the actual location of the school. Existing agencies and facilities may make this division of the Health Suite unnecessary.

Health Suite Equipment

Waiting Room
- 2 Settees 5′ 0″
- 1 Costumer
- 1 Umbrella Stand
- 1 Waste Receptacle
- 1 Bulletin Board
- 1 Table 24″ x 36″
- 1 Light Switch
- 3 Side Chairs
- 1 Ceiling Light
- 1 Wall Receptacle Duplex

Medical Office
- 1 Desk 42″ Flat Top
- 1 Revolving Desk Chair

1 Filing Cabinet, Legal—4 Drawer
1 Filing Cabinet, Letter—4 Drawer
2 Filing Cabinets, 8 Drawer, 2 Partitions to hold 5 x 8 health cards
2 Letter Files—Desk Type
2 Side Chairs
1 Waste Basket
1 Desk Lamp
1 Electric Clock
1 Inter-Communicating Phone
1 Outside Phone
3 Duplex Wall Receptacles
1 Light Switch
1 Ceiling Light
1 Steel Clothing Locker 12″ x 18″ x 72″

Examination Room
1 Bulletin Board
1 Floor Marker for Vision Test
1 Eye Chart Box—Illuminated
1 Combination Switch and Outlet
1 Instrument and Dressing Table
1 Sterilizer on Stand
1 Electric Hot Plate
1 Sink-Foot Controls
1 Soap Dispenser—Liquid
1 Paper Towel Dispenser
1 Mirror
1 Stainless Steel Shelf
1 Paper Cup Dispenser
1 Medicine Cabinet
1 Supply Cabinet
1 Closet with Shelves and Clothing Rod
1 Spotlight
1 Instrument Cabinet
1 4-Fold Screen
1 Weighing Scale
1 Electric Clock
1 Sani-Can, Large
5 Duplex Wall Receptacles
2 Ceiling Lights
1 Costumer
1 Steel Clothing Locker

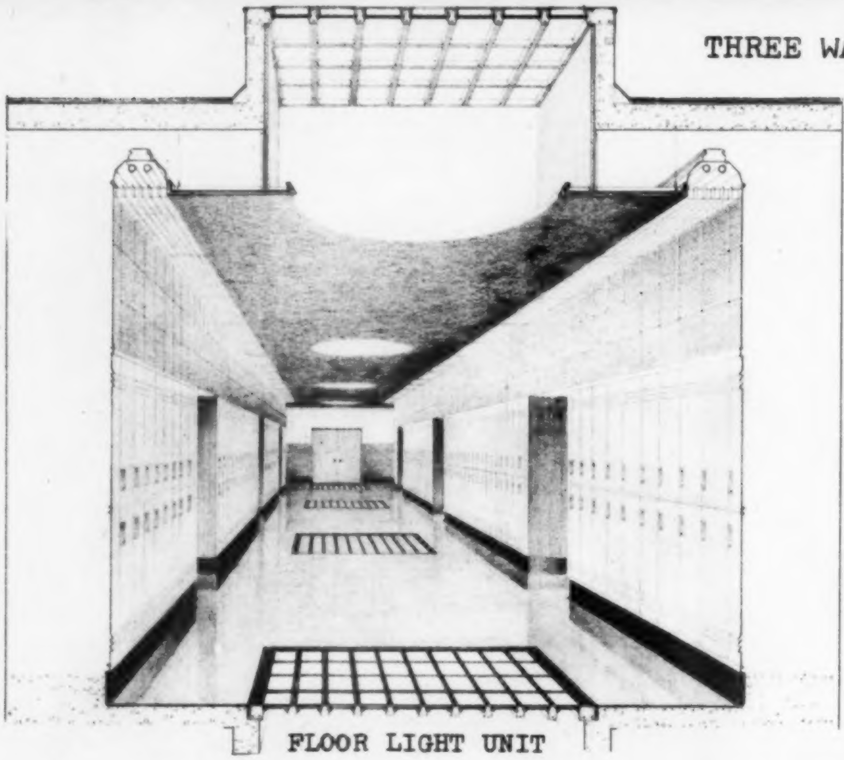
Restroom
2 Cots
2 Side Chairs
1 Waste Receptacle
1 4-Fold Screen
1 Combination Switch and Outlet
1 Ceiling Light
1 Duplex Wall Receptacle

Lavatory
1 Water Closet—Silent Flush
1 Paper Holder
1 Sani-Can, Large
1 Mirror
1 Sink
1 Paper Cup Dispenser
1 Soap Dispenser—Liquid
1 Paper Towel Dispenser
1 Combination Switch and Outlet
1 Ceiling Light

Dental Office
1 Bulletin Board
1 Desk 42″ flat top
1 Revolving Desk Chair
1 Steel Clothing Locker
1 Side Chair
1 Card File 2 Tray, 5″ x 8″
1 Supply Closet
1 Dental Instrument Cabinet
1 Wiring and Piping Connection for Unit
1 Dental Chair and Cuspidor
1 Electric Hot Plate
1 Sterilizer on Stand
1 Electric Clock
1 Sani-Can, Large
1 Sink Foot Controls
1 Soap Dispenser, Liquid
1 Instrument and Dressing Table
1 Medicine Cabinet
1 Mirror
1 Steel Wall Shelf
1 Paper Cup Dispenser
4 Duplex Wall Receptacles
1 Combination Switch and Outlet
1 Ceiling Light
1 Steel Clothing Locker

BUILDING PRODUCTS AND SERVICES

Flagpoles
Roofing
Glass Block
Structural Tile
Windows
Metal Trim
Flooring
Stair Treads
Acoustical Materials
Heating and Ventilation
Plumbing
Lighting
Window Shades
Partitions
Wardrobes
Electrical Equipment



THREE WAY GLASS BLOCK ROOF LIGHTS

The modern method of daylighting school corridors and other areas. The dead air space in the hollow blocks reduces solar heat transmission and is an insulation against winter temperatures . Ideal for use in air conditioned buildings . The natural light transmitted is softly diffused over wide areas . The use of floor lights below the roof lights is suggested as a means of daylighting the corridor below.

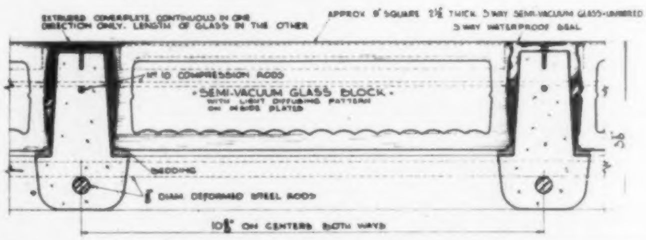
Installation Showing Cross Section Through School Corridor

SPECIFICATION

3-Way Semi-Vacuum Block-Skylights are manufactured by the American 3 Way-Luxfer Prism Co., Chicago, Ill. and New York, N. Y. Blocks are 9 in. square, 2½ in. thick over all and spaced approximately 10⅝ in. on centers. Top and bottom plates shall be not less than $\frac{1}{32}$ in. in their least section. Light diffusing lenses shall be incorporated in inner surfaces leaving exposed surfaces smooth.

The reinforced concrete supporting grid shall be designed for minimum live load of 40 lb. per sq. ft. All borders shall be flashed as per manufacturer's details. Flashings are specified under separate contract.

- **GOOD INSULATION VALUES**
- **UNIFORM LIGHT DISTRIBUTION**

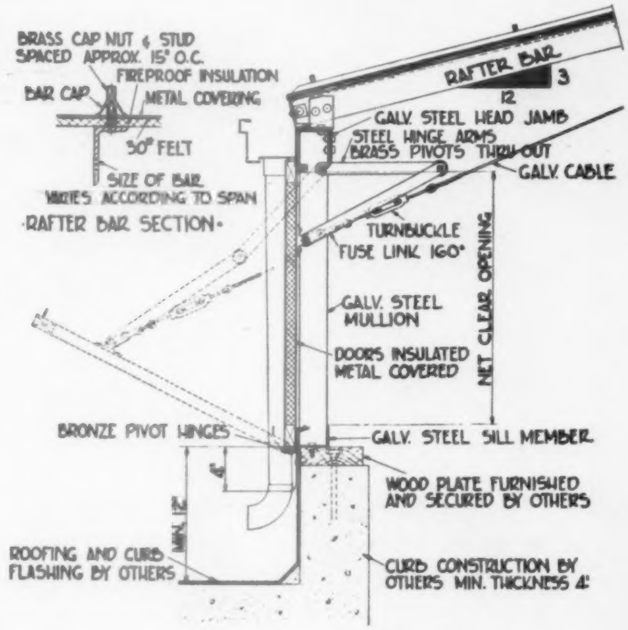


DATA	3⅞" Thick Construction	4⅜" Thick Construction
Maximum One Way Bearing Span Not over	7'-2"	8'-0 ⅜"
Any Length the Other Way	....	....
Maximum Precast Panels	7 units wide by 4 units long or 28 sq. ft. overall panel	
Maximum Monolithic Panels	8 units wide by 12 units long	9 units wide by 12 units long
Minimum Pitch Required	¼" to 12"	¼" to 12"
Concrete Mix— Weight per Square Foot	35 lbs.	42 lbs.
Haydite Concrete— Weight per Square Foot	30 lbs.	35 lbs.
Live Load	40 lbs. plus	40 lbs. plus

AMERICAN AUTOMATIC STAGE VENTILATOR

No. 67-M

American No. 67-M Stage Vents are manufactured by American 3 Way-Luxfer Prism Co. Ventilator opens automatically in case of fire and is adjustable by hand for ordinary purposes.



Sheet metal trim is #24 gauge galvanized steel. (Or 16 oz. cold rolled copper).

The sides of the ventilator have well constructed corners and mullions with openings fitted with metal ventilating doors. The doors are hinged at the bottom with galvanized hinges and swing out, leaving an absolutely unobstructed passage for gasses, smoke and foul air.

Connecting the upper part of each door with head jamb, is a combined jack knife bracket and check arm which acts as a lever in thrusting doors outward and at the same time prevents the doors from opening outward beyond a certain point, also holds doors rigid against wind when open.

Doors are held in the closed position by flexible cables running over pulleys and attached to fusible links at the doors, the other ends of the cables being connected to one or more main control ropes. The main control ropes are carried down to a point where they can be quickly and conveniently released from the floor, using the "3 Way" control panel with lever arm release.

Doors are insulated with ⅞" thick celotex and are metal covered.

The roof of the ventilator is hip design of steel rafter bar construction. Roof is covered with a metal deck layed over ⅜" thick fireproof board insulation.

All ferrous metal parts are given one shop coat of mineral primer.

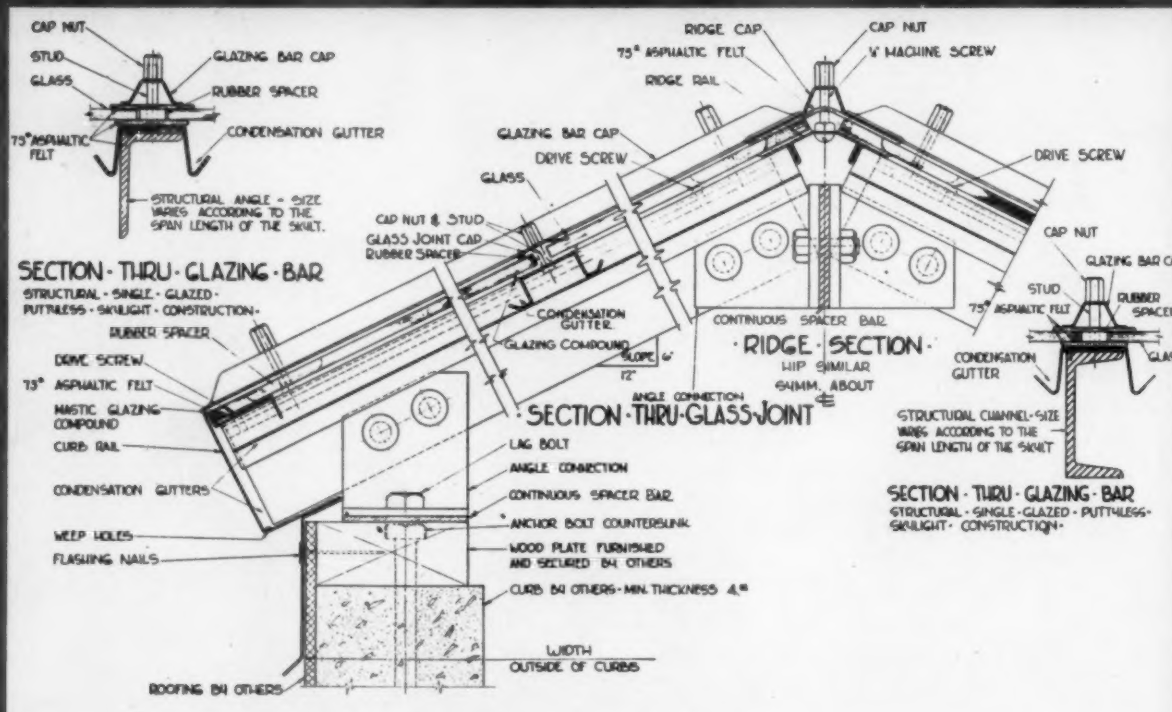
Note curb construction.

AMERICAN STAGE VENTILATOR

Automatic in case of fire. Flames shoot upwards, which prevents spreading of fire and danger of panics. A combined ventilator and weatherproof skylight for use in theatres, moving-picture houses, public, parochial and high schools, auditoriums, temples, etc.

Shutters for opening skylight are hand-operated, but may be slammed wide open instantly by cutting the rope. In case of fire, the fusible links are melted or ropes burn and shutters open automatically.

Scientifically constructed with provisions for daylighting and ventilation besides its safety features. Weatherproof—impervious to rain, snow, ice or sleet.



CROSS SECTION THRU STRUCTURAL "SP5" ANGLE TYPE SKYLIGHT

TYPES OF AMERICAN VENTILATING SKYLIGHTS

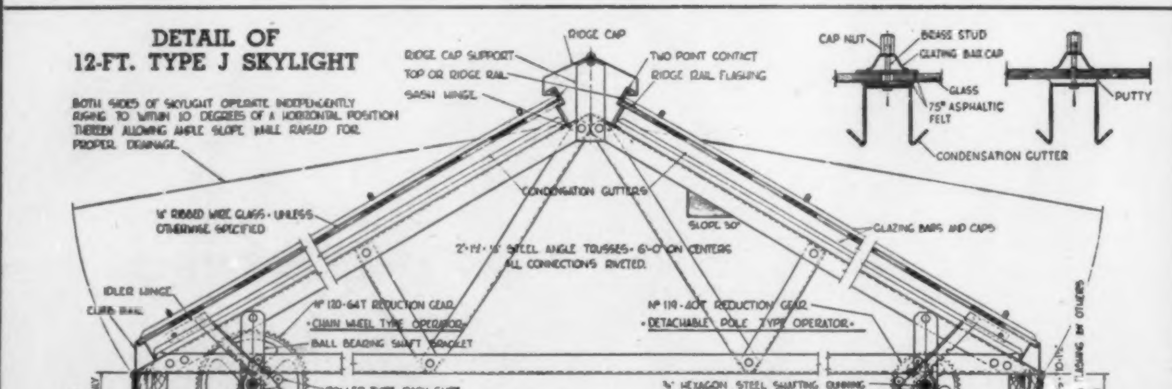
Type J—A full ventilating type, wherein the sash is hinged at the ridge and opened from the curb, thus providing a maximum vent area. Each side is controlled by a separate operator.

Type JR—A full ventilating type, designed especially for use on widths under 6 ft. Also applicable as a continuous ridge ventilator for saw-tooth construction.

Type JL—A ridge ventilating type designed for spans over 12 ft. The upper or vent sash is in widths corresponding to the standard Type J widths. Thus continuous ridge openings of 8 and 10 ft. may be had.

Type F—A ridge ventilating type, consisting of a pair of constant sized movable sash at the ridge and fixed sash below. Vent sash may be operated independently or simultaneously by means of a single control. Provides maximum weather-tightness with efficient ventilation and day-lighting.

DETAIL OF 12-FT. TYPE J SKYLIGHT



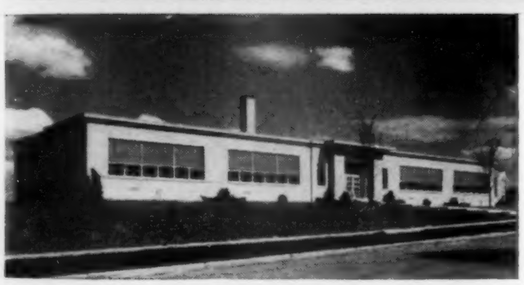
AMERICAN 3 WAY-LUXFER PRISM CO.

431 S. Dearborn Street, Chicago 5, Ill. ★ ★ 26-20 Jackson Avenue, Long Island City 1, N. Y.

AMERICAN STRUCTURAL PRODUCTS CO.

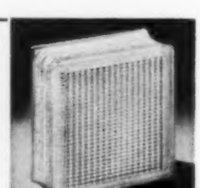
INSULUX PRODUCTS DIVISION, DEPT. E-139
Toledo 1, Ohio

This method of fenestration is making a most significant contribution to school lighting. Insulux Prismatic Glass Blocks (No. 351) are combined with a clear vision strip. This photograph was taken with the aid of some additional lighting.



In the Oakdale Christian School, Architect James K. Haveman, Grand Rapids, Michigan, has created a pleasing, unadorned exterior. See how well Insulux complements his design.

Insulux Prismatic Block No. 351 has been developed for accurate daylight control. The pattern, utilizing the four faces of the block, turns light upward. The ceiling acts as a huge reflector to redirect light downward.



INSULUX

GLASS BLOCK

AMERICAN STRUCTURAL PRODUCTS COMPANY

Subsidiary of

OWENS-ILLINOIS GLASS COMPANY

This kind of school daylighting doesn't "just happen"

LOWER brightness ratios, better daylight distribution, designed into new Oakdale Christian School, Grand Rapids, Michigan, by architect James K. Haveman.

This daylighting is the result of long research and careful planning. *It didn't just happen!*

The first factor in achieving these lighting benefits was the development and light-performance measurement of a light-directional glass block fenestration system which could meet the exacting requirements of the school classroom.

Next step was proper interior room design, including reflectivities to make the system work to best advantage.

As a result of studied planning, most brightness ratios are kept within 10 to 1, within a 60-degree cone of vision. Diversity in task brightness from first desk to last desk across the room is kept within a ratio of 5 to 1 under illumination of sky only, and about 3 to 1 under direct sun.

Write for free manual, "Daylight in School Classrooms," which contains complete technical information useful in planning better school lighting. Write Dept. E-139, American Structural Products Company, P.O. 1035, Toledo 1, Ohio. (American Structural Products Company is a wholly owned subsidiary of the Owens-Illinois Glass Company. It has taken over the manufacture and sale of Insulux Glass Block and other Owens-Illinois structural products.)

ARCH ROOF CONSTRUCTION CO., INC.

Engineers and Contractors

TELEPHONE
CHickering 4-3516

113 West 42nd Street, New York 18, N. Y.

DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

LONG SPAN ROOF ARCHES

SCOPE OF APPLICATION AND SERVICE

We design, construct, and erect, or just design, long span roof arches for gymnasiums; field buildings; theaters; auditoriums; convention, exhibition and fair buildings; skating rinks; and all buildings where unobstructed space (no columns, posts or trusses), together with maximum light and ventilation are desired.

SPANS TO OVER 800 FEET

Short lengths of steel or wood are used in the patented designs for buildings having clear spans to 800 feet or more, with heights to suit.

FIELD BUILDINGS

Our field or sports buildings can be erected for use as auditoriums, theaters, and gymnasiums, in addition to being used for such sports activities as ice hockey, baseball, football, basketball, etc. These buildings are easily interchangeable (without structural changes) permitting daily varied uses of one efficient building instead of requiring several infrequently used buildings.

ENGINEERING

All our arches are scientifically designed as hingeless, one, two, or three-hinged arches, and any competent structural engineer can design and check our arches. In our design, ample provision is always made for all dead, live and unbalanced loads, rib shortening, temperature variation, etc.

SWARTHMORE COLLEGE FIELD HOUSE

ADVISORY SERVICE

We will gladly provide information and suggestions, based on our more than 26 years of specialized experience in the design and construction of long span buildings, to school officials, architects, and engineers for the most economical and efficient designs of these buildings.

INQUIRIES INVITED

Inquiries are invited regarding design, construction, estimates, and cost of completed buildings, without obligation. Please send data such as width and length of buildings, use of building, seating capacity, approximate geographic location, and add any special features under consideration, so we can give you the information you seek based on your particular problem.

ALL OUR WORK IS GUARANTEED UNCONDITIONALLY

BUCKNELL UNIVERSITY GYMNASIUM

United States Patents

1,480,882	January 15, 1924
1,639,930	August 23, 1927
1,783,958	December 9, 1930
1,795,331	March 10, 1931
1,891,346	December 20, 1932
2,021,480	November 19, 1935
2,031,937	February 25, 1936
2,211,848	August 20, 1940
2,376,906	May 29, 1945

Canadian Patents

329,165	January 10, 1933
331,206	March 28, 1933

Great Britain Patents

382,138	January 18, 1932

Other patents pending

SETON HALL COLLEGE GYMNASIUM

HANOVER COLLEGE GYMNASIUM

VARIOUS TYPES OF ARCH ROOF CONSTRUCTION *for Every Requirement*

THE BARRETT DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

2800 So. Sacramento Avenue, Chicago 23, Ill. — 36th & Gray's Ferry Avenue, Philadelphia 46, Pa. — 1327 Erie St., Birmingham 8, Ala.

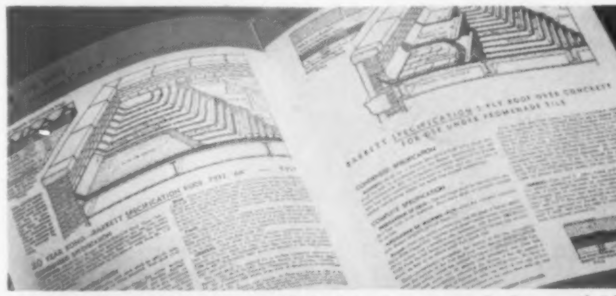
PRODUCTS

Roofing Materials—For Flat Surfaces: Barrett Specification* pitch and felt roofs, Black Diamond* pitch and felt roofs. Tarred and Asphalt Saturated Felts and Fabrics, Coal-Tar Pitches, Asphalt Cements, etc.

For Steep Surfaces: Barrett* Steep Roof Pitch and Felt Roofs, Anchors* asphalts and S.I.S.* roofing. Barrett* Asphalt Shingles and Roll Roofings.

Miscellaneous—Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Roof Coatings and Cements for general roof repair and maintenance—protective paints. Rock Wool Insulation, Building Papers for sheathing, lining, etc. Dampproofing and plaster bond Coatings. Wood Preservatives. Roof Drain and Vent Connections. Barrett Tarvia-lithic* bituminous concrete for playground surfacing, roadways, paths and tennis courts.

For complete information about these and other products, write the Barrett office nearest you.



BARRETT specifications, published in Sweet's and also available in the Barrett Reference Manual for Architects and Engineers, stipulate exact quantities and qualities and proved application techniques to produce a uniformly dependable result

BARRETT SPECIFICATION* Pitch and Felt are the only pitch and felt that measure up to the high standards of the Barrett Specification* roof. They are the finest built-up roofing materials that can be made

THE BARRETT SPECIFICATION* ROOF . . . the toughest, longest-lasting, best-value built-up roof made

The superiority of the Barrett Specification* Roof is due to the combination of highest-quality roofing materials, the protective surface of gravel or slag, and scientifically standardized application techniques used by Barrett Approved Roofers. The result is a roof so good that it can be bonded against repair and maintenance expense for periods up to 20 years—a roof so good that it regularly outlasts the bonded period by many years. Note, also, that Barrett Specification* roofs take Fire Underwriters' Class A rating—a fact of obvious importance to school boards and parents of school children.

The Gravel or Slag Armored Surface of a Barrett Specification* Roof is firmly embedded in a final pouring (not mopping) of hot Barret Specification* pitch. This means extra protection against weather, fire and mechanical damage

ROOF-TOP RECREATION AREAS extend the usefulness of Barrett Specification* Roofs

The full utilization of roof areas has become an important consideration in the planning of modern school buildings. By use of promenade tile and other types of surfacing, Barrett Specification* roofs make it possible for architects to plan and provide roof-top recreation and sun deck rest areas, outdoor cafeterias, etc., that are safe from the noise, dirt and dangers of surface traffic. In some cases, it may even be advantageous to provide roof-top automobile parking areas for the convenience of teachers and students.

Barrett* Specification* Roofs

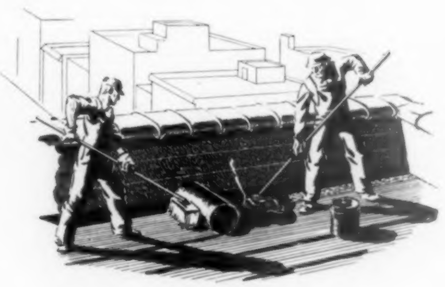
* Reg. U.S. Pat. Off.

Architects and school boards may rely with confidence upon any Barrett Approved Roofer to apply a Barrett Specification* Roof exactly according to Barrett specifications. Barrett Approved Roofers are carefully selected on the basis of their experience, ability and integrity

THE TEXAS COMPANY

Manufacturers of

TEXACO SOLID ROOFING ASPHALT
TEXACO ASPHALT SHINGLES and ROOFING



TEXACO Solid Roofing Asphalt

preferred by many large roofers for schools and universities because:

- Texaco is top quality asphalt—99½% pure
- Texaco strips easily . . . saves time and labor on the job
- Texaco mops on easily . . . spreads evenly . . . leaves a uniform, long lasting coating
- Texaco is clean asphalt . . . keeps kettles cleaner longer
- Texaco asphalt is a product of The Texas Company—one of the world's largest producers of asphalt
- Texaco is a name that millions know—and trust

SEE your nearest Texaco Roofing Dealer or write to the nearest Division Office

In 100-lb. Cartons and Paper Bags

NOW AVAILABLE

TEXACO ROOFING DEALERS EVERYWHERE East of the Rockies

The Texas Company *Division Offices:*	Atlanta, Ga.	Dallas, Texas	Houston, Texas	Minneapolis, Minn.	New York, N. Y.
	Chicago, Ill.	Denver, Colo.	Indianapolis, Ind.	New Orleans, La.	Norfolk, Va.

PITTSBURGH CORNING CORPORATION

Room 444-8, 632 Duquesne Way, Pittsburgh 22, Pa.

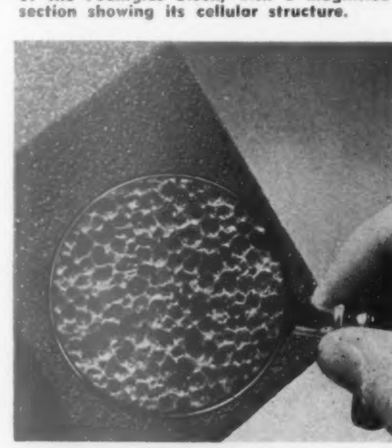
PC FOAMGLAS INSULATION

for Modern Schools

This picture shows how PC Foamglas insulation is applied and how roofing is built up. All sorts of flat deck roofs, on all sorts of buildings all over the country, have been insulated—for good—with PC Foamglas.

In the core wall illustrated above, PC Foamglas is laid between outer and inner brick walls. It helps to maintain temperature levels, to minimize condensation, *permanently*.

Below, you see the smoo'h, even texture of the Foamglas block, with a magnified section showing its cellular structure.



When you insulate with FOAMGLAS . . . you insulate for good!

BECAUSE— The big light blocks consist of millions of minute air cells, enclosed in true glass.

Because, being glass, PC Foamglas is waterproof, fireproof, verminproof, and impervious to most acids. It withstands high humidities, helps to maintain predetermined temperature levels, to minimize condensation.

Because when installed according to our specifications, for recommended applications, PC Foamglas retains its original insulating efficiency *permanently*. First cost is last cost with PC Foamglas.

Check other insulations carefully, when you are considering insulation for roofs, walls and floors, and compare them with PC Foamglas. That is how you can buy insulation on a "last cost" basis, with PC Foamglas. For full information, send for free copies of our booklets. Pittsburgh Corning Corporation, 632 Duquesne Way, Pittsburgh 22, Pa.

— Also Makers of PC Glass Blocks —

PITTSBURGH PC CORNING ®

FOAMGLAS INSULATION

FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS

PITTSBURGH CORNING CORPORATION

Room 652-8, 632 Duquesne Way, Pittsburgh 22, Pa.

PC Glass Blocks

FOR SCHOOLS

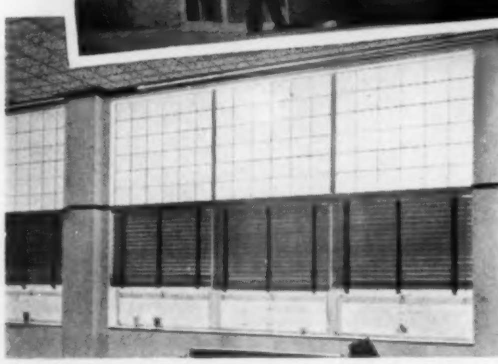
offer ample light, utility and beauty

PC GLASS BLOCKS are unusually well suited for use in school construction. They provide greater operating efficiency for the building itself, greater comfort for students and instructors.

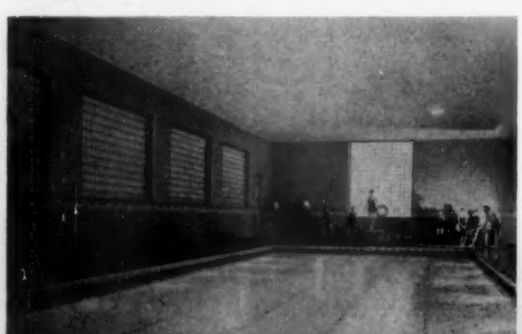
A generous supply of diffused daylight is supplied by large panels of glass blocks in auditoriums, gymnasiums, study halls and corridors. In classrooms where glass blocks are used, glare is reduced, yet ample light, directed even to remote desks, lessens eye-strain, enhances the well being and efficiency of pupils.

PC GLASS BLOCKS have the unique distinction of being the only building material capable of providing, in one unit, abundant diffused daylight, ease of cleaning, low maintenance cost and adequate insulation.

PC GLASS BLOCKS are suitable for any style of school construction. They blend harmoniously with the architectural design of old or new buildings, are ideally suited for sash replacement in older buildings as well as for new construction.



In classrooms, PC Glass Blocks supply ample diffused light even to remote desks, reduce glare and eye-strain, exclude distracting views and prevent infiltration of dirt and grit.

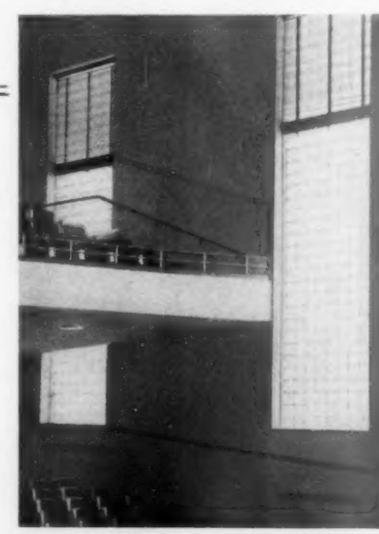


In swimming pools PC Glass Blocks direct natural light to areas remote from light openings. They withstand dampness, as there is no wood or metal sash to rot, check, scale, rust or need frequent repainting.

● For further information about PC Glass Blocks, write for our illustrated booklet, which shows many and varied uses of PC Glass Blocks in schools. It contains photographs of the full line of PC Glass Block patterns and describes the special functions of each. Also included are lists of available sizes and shapes, installation details and specifications. A free copy will be sent to you on request.

PC GLASS BLOCKS

THE MARK OF A MODERN BUILDING



In auditoriums, study halls, corridors, PC Glass Blocks provide safe lighting, yet prevent heat losses through large panels. Repairs and replacements seldom are needed, cleaning and maintenance costs are low. Pittsburgh Corning Corporation also makes PC Foamglas Insulation.

FOR ADDITIONAL INFORMATION SEE OUR INSERTS IN SWEET'S CATALOGS

PITTSBURGH PC CORNING

T. M. REG. U.S. PAT. OFF.

GLASS BLOCKS

Distributed by PITTSBURGH PLATE GLASS COMPANY

by W. P. Fuller & Co. on the Pacific Coast and by Hobbs Glass Ltd. in Canada

NATIONAL FIREPROOFING CORPORATION

GENERAL OFFICES 202 EAST OHIO STREET • PITTSBURGH 12, PA.

BRANCHES: New York (17), 205-17 East 42nd Street • Chicago (6), 205 W. Wacker Drive • Philadelphia (2), 1518 Walnut Street • Detroit (8), 5737 Commonwealth Avenue • Boston (16), 20 Providence Street Syracuse (10), 225 Kensington Place • North Birmingham (7), Ala.
IN CANADA: National Fire Proofing Company of Canada, Ltd., Toronto, Ontario

NATCO *Ceramic Glaze Structural Facing Tile*

for Interior Walls, Partitions and Wainscots in Modern School Buildings

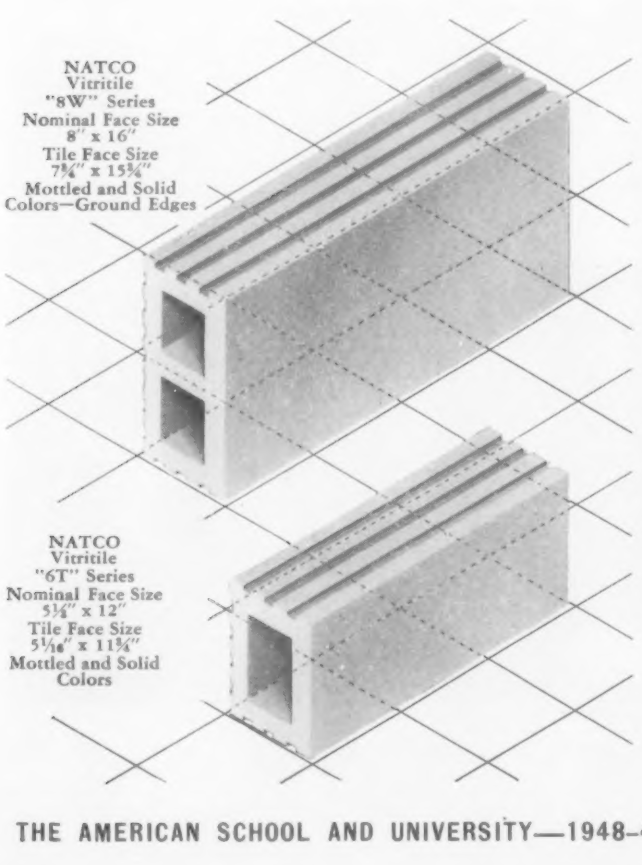
Combine fire safety with permanent attractiveness in your School Building Interior Design.

With Natco Ceramic Glaze Structural Facing Tile, you get the utmost in strength and durability in a wide variety of pleasing, light-reflecting colors and textures. With it, you can build a permanent, easily cleaned structural wall with a smooth, impervious, glass-hard, enduring finish--all in one.

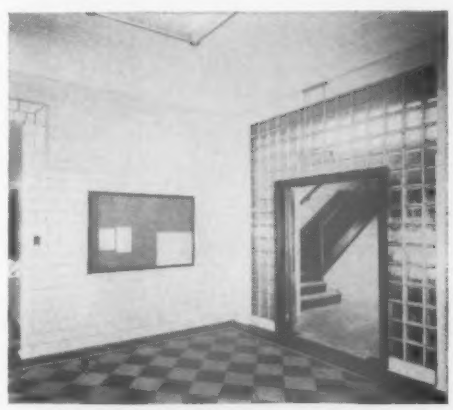
Natco Ceramic Glaze Structural Facing Tile does not scratch, crack or mar, never needs painting or repairs—does not harbor grease, dirt, grime or bacteria. You can clean it with soap and water. You get increased sanitation . . . . greater durability.

Furnished now in modular sizes, Natco Ceramic Glaze Structural Facing Tile gives you greater design and flexibility with less work in cutting and fitting—less material waste, reduced construction time with earlier occupancy.

Write for prices, samples and descriptive literature.



Natco Ceramic Glaze Vitritile, in High School for Home Making, Brooklyn, N.Y. Eric Kebbon, Architect, New York City.



Natco Ceramic Glaze Vitritile, 6T Series, in Western College, Oxford, Ohio. Charles F. Cellarino, Architect, Cincinnati.

Gymnasium in Wauwatosa High School with walls of 8W Series Natco Ceramic Glaze Vitritile. Herbst & Kuenzle, Architects. Selzer, Ornst Company, Contractors.

Natco Ceramic Glaze Vitritile, in Cafeteria of Knoxville Public School, Pittsburgh, Pa.

UNITED STATES QUARRY TILE CO.

General Offices: 731 Renkert Bldg., Canton 2, Ohio

Sales Representatives at:

New York 17, N. Y.	110 E. 42nd St.
Brooklyn, N. Y.	16 Court St.
Bronx, N. Y.	2488 Grand Concourse
Jersey City, N. J.	2800 Hudson Blvd.
Philadelphia, Pa.	401 N. Broad St.
Chicago, Ill.	209 N. Parkside Ave.
San Francisco, Calif.	819 Bryant St.
Denver, Colo.	2120 E. 11th St.
St. Louis, Mo.	5404 Robert Ave.
New Orleans, La.	P. O. Box 2715
Brookline, Mass.	P. O. Box 128
Detroit, Mich.	Room 3-147 General Motors Bldg.
Cincinnati, Ohio	7228 Eastlawn Drive
Houston, Tex.	4601 Montrose Blvd.
Atlanta, Ga.	317 Forrest Ave. N. E.
Rochester, N. Y.	214 Daley Blvd.
Hopkins, Minn.	45 15th Ave.
Euclid, Ohio.	171 E. 209th St.

PRODUCTS

Romany Glazed Wall Tiles are buff body tiles for interior use, manufactured in a variety of colors and in sizes and shapes based upon 4¼" x 4¼" and 6" x 6" standards with trim. See our more complete catalogue for list of colors, sizes and shapes.

Romany Glazed Floor Tiles are red body tiles with hard finish matt glazes. Sizes and colors are similar to above.

Romany Red Body Glazed Tiles are suitable for either interior or exterior use where a heavy duty glazed tile is required.

Romany Tunnel Tiles are enduring red body glazed tiles with special bonding back.

ROMANY TILES

for
FLOORS
WALLS
TOILETS
SHOWERS
KITCHENS
CAFETERIAS
AUDITORIUMS
CORRIDORS
FOYERS
FOUNTAINS

FREE CATALOGUE

Catalogue of more detailed information and illustrations of helpful suggestions will be sent free upon request. Please address requests to our Canton office.

SMOOTH CEILINGS SYSTEM

(U. S. Patents Nos. 1,950,422 and 2,000,543)

802 Metropolitan Life Building
Minneapolis 1, Minn.

REPRESENTATIVES IN PRINCIPAL CITIES

A FLAT BEAMLESS UNIVERSAL FLOOR CONSTRUCTION FOR SCHOOL BUILDINGS

Adapted to Reinforced Concrete and Structural Steel Designs by the Modern Method—Elastic Analysis

GENERAL DESCRIPTION—The "Smooth Ceilings" System is normally designed as a 2-way flat slab in accordance with standard building code requirements using the modern method of elastic analysis. The steel column heads or grillages are embedded in the slabs. No concrete caps are required on the columns. The columns may be reinforced concrete, structural steel, steel pipe or cast iron. The floor slabs may be of solid concrete or have light weight blocks or tile fillers embedded in them to reduce dead load and improve plaster bond. Slabs may be built with 2-way joists and removable pans. This system has been used in many important buildings by discriminating architects since 1931. Its practical advantages have been demonstrated in the principal construction centers.

ADAPTABILITY—Because of modern, scientific design methods, the construction is adaptable to irregular column spacing, commonly required in school buildings. It has been successfully used in school and university buildings, with resulting economies in first cost and maintenance.

SERVICES—We license the use of our system by others. We furnish preliminary estimates including quantities of steel and concrete. We suggest suitable framing layouts. We quote delivered prices for steel column heads required. Our engineers are at your service, ready to co-operate. Any qualified structural engineer can design the system.

OUTSTANDING ADVANTAGES AND ECONOMIES

ADEQUATE STRENGTH—Load tests on "Smooth Ceilings" System show very small deflections, good recovery and low stresses in the concrete and steel. **Tested and Approved by Board of Standards and Appeals, New York City and others.**

FLEXIBILITY OF SLAB DESIGN—Floor slabs may be solid concrete or cellular with light weight fillers. Ceilings may be smooth or coffered to suit design requirements. Plaster may be applied directly to the concrete ceiling with or without bond coat, depending on conditions, with resultant cost reduction.

SAVES IN HEIGHT OF BUILDING—The full clear height between floor and flat ceiling may be utilized with usually a saving of several inches in each story height, aggregating several feet in the total height of the average building. Not only are construction costs reduced but operating costs are minimized.

FORMING COSTS REDUCED — The flat deck forms require a minimum amount of cutting and fitting. Therefore the cost of forms for concrete is very low and form lumber salvage exceptionally high.

COST OF AIR CONDITIONING INSTALLATIONS REDUCED — Overhead air conditioning duct work is simply and economically installed. The duct work can be run at will on the flat ceilings. No beams, etc., to dodge. Less height is required.

UNPLASTERED CEILINGS — Where smooth forming materials are used solid concrete ceilings may be acceptably finished and decorated without plaster, a further cost reduction.

SMALLER COLUMN FURRING REQUIRED — Due to design of steel column heads small ducts and pipes can pass through slab close to column shaft.

LOW PLASTERING AND DECORATING COSTS—Because of the complete elimination of beams, girders, drop panels and flared column caps, plastering, decorating and finishing costs are materially reduced both in time and material.

IDEAL LIGHTING CONDITIONS—Since there are no interrupting beams, girders, drop panels, etc., the smooth ceiling expanse assures maximum reflectivity, fewer lighting fixtures and less current consumption.

ACOUSTICS IMPROVED—The all flat ceilings are ideal and economical for acoustic treatment.

Wall span 23 ft., corridor span 10 ft.

Morris Park School, Minneapolis, Minnesota
Board of Education, Architect

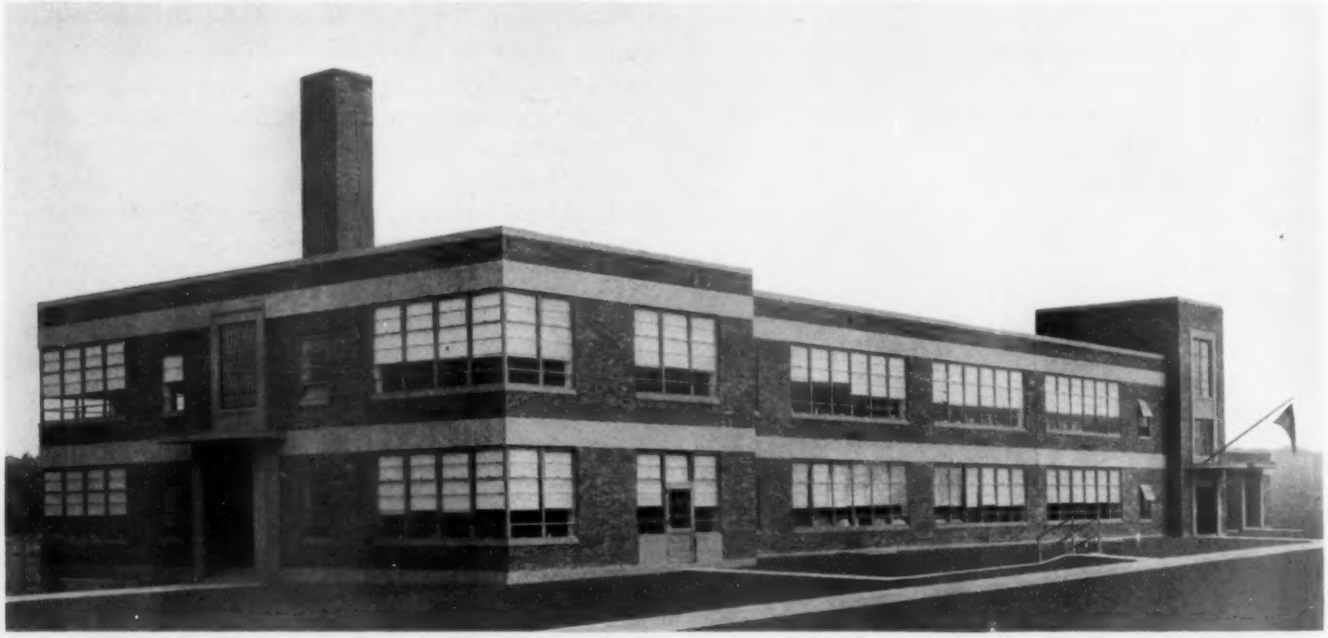
Note: Tile fillers in slab; irregular column spacing; rectangular columns; inverted wall beams which permit high window heads. $4.200 was saved on this school by changing from one way concrete joists to "Smooth Ceilings" System plus further annual savings in maintenance costs.

MICHAEL FLYNN MANUFACTURING CO.

(MEMBER METAL WINDOW INSTITUTE)

714 East Godfrey Avenue, Philadelphia 24, Pa.

Manufacturers of Metal Windows, Doors, Skylights, and Window Operating Devices



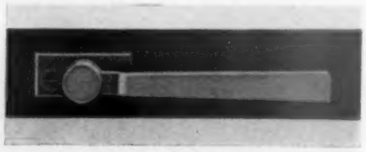
George Harris Richardson Elementary School, Washington, D. C. Architect: M. A. Coe, Municipal Architect, District of Columbia. Builder: J. D. Hedin Construction Co., Washington, D. C.

Modern school design calls for bright, cheerful classrooms with large window areas. With Lupton Metal Windows, you get all these advantages:

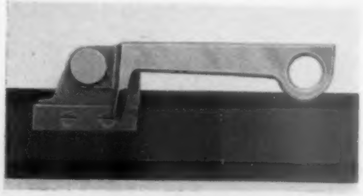
(1) Modern appearance.
(2) Abundant, non-glare daylighting, assuring clear, effortless vision in every part of the room.
(3) Controlled, natural ventilation.
(4) Weathertight, easy operation.
(5) Cost is surprisingly low.

Neat, narrow metal frame screens with bronze wire cloth can be furnished for open-in or open-out ventilators. There is a Lupton Metal Window for every type of educational building. Write for our catalog or see it in Sweet's.

Beautifully designed locking hardware is a feature of Lupton Metal Windows. Graceful in appearance, functional in design. Easy on the hand as well as on the eye. Available in solid bronze.



Illustrated above is the new locking handle for open-in ventilators of Lupton Architectural Projected Windows. Latch and keeper are concealed within the meeting rail.



Illustrated above is locking handle for open-out ventilators. Designed for operation by hand or by window pole.

LUPTON METAL WINDOWS

ESTABLISHED
Since 1828

CORNELL IRON WORKS, INC.

Members of the One Hundred Year Association, Inc., of New York

36th Avenue at 12th Street, Long Island City 6, N. Y.

102 REPRESENTATIVES IN PRINCIPAL CITIES

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(Above) LABELED ROLLING STEEL (Llenroc) FIRE DOOR, coiling under lintel in the opening between the jambs. Shown in section. Note the overhead counterbalancing shaft, used both in rolling doors and rolling grilles; and the enclosing hood. Side guides may be concealed in the wall and the overhead coil hidden in the ceiling

PRODUCTS

ROLLING GRILLES AND GATES in steel and other metals; SLIDING GRILLES in steel or aluminum; ROLLING DOORS and SHUTTERS in steel, other metals and wood; Underwriters labeled rolling STEEL FIRE DOORS; complete line of UPWARD ACTING DOORS in wood or metal; MOTOR OPERATORS. Makers of fine doors for over one hundred years. CORNELL IRON WORKS, INC., owes its origin to George Cornell, who purchased his employer's metal business July 29th, 1828, in New York City.

SEND FOR CATALOG W

Pair of fully concealed CORNELL ROLLING STEEL AUTOMATIC FIRE DOORS coiling under lintel. (Photos show open and partially closed positions)

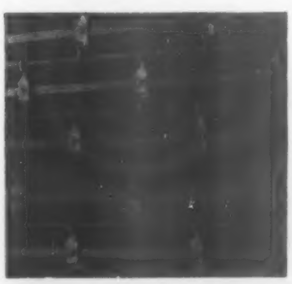
CORNELL ROLLING DOORS AND ROLLING GRILLES

The Rolling Doors are made up of interlocking metal slats running in vertical metal side guides, flexible to coil. Steel curtains are hot galvanized. Wood slats strung on metal cables form the curtain of wood rolling doors.

Rolling Fire Doors are labeled by Underwriters' Laboratories, Inc., for fire walls, etc.

Cornell Iron Works, Inc., are the originators of the Rolling Grille in America. Cornell Rolling Grilles operate like rolling doors, but they do not block light, air, or vision. They have been widely accepted for school corridors, etc. Can be completely concealed when open. Rolling Grilles are made of 5/16" round hard drawn galvanized steel bars running continuous horizontally from jamb to jamb and locked into rolled steel vertical side guides. The horizontal bars are flexibly connected by unbreakable vertical steel links; permitting entire grille to coil overhead.

Patented Locking Device for Rolling Grilles is workable from either side.



Close-up view of ROLLING GRILLE curtain, CORNELL Standard Butterfly Type

CORNELL ROLLING GRILLE in school corridor, Kansas. Side guides and overhead coil are concealed in jambs and ceiling

Three CORNELL ROLLING GRILLES separating locker rooms from gymnasium; Castlemont High School, Oakland, California

CORNELL ROLLING STEEL GRILLES closing off stairways, New York City Public School

INLAND STEEL PRODUCTS COMPANY

Milwaukee 1, Wisconsin

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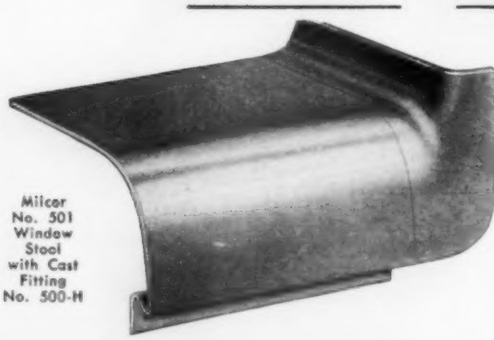
For every exposed interior detail,
there is an appropriate Milcor Metal Trim item

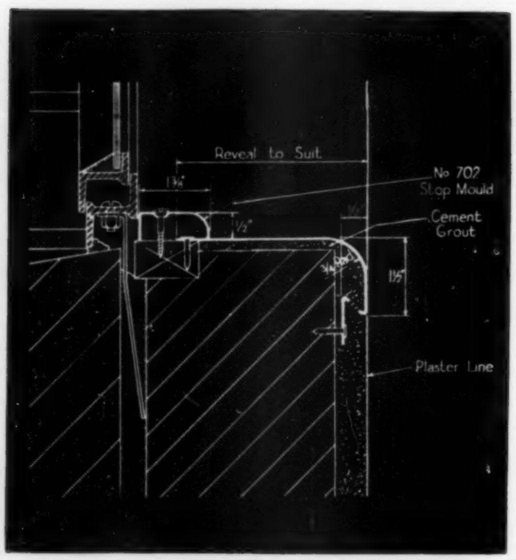


Milcor No. 501 Window Stool with Cast Fitting No. 500-H

Milcor Metal Window Trim

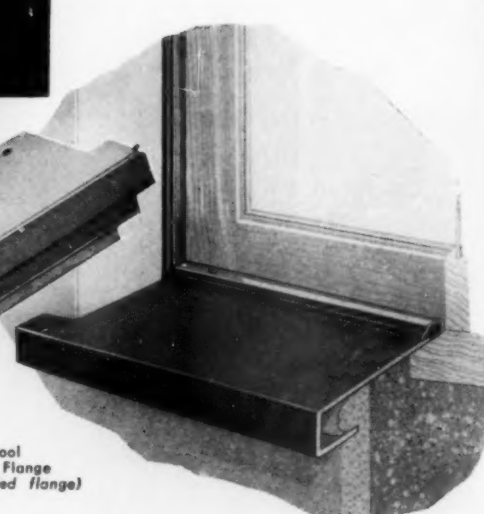
Milcor Metal Window Trim includes: (*a*) completely-mitred, welded and assembled, ready-to-install frames; (*b*) individual units (flush-with-plaster or projecting types) which can be used separately or in combination with other sections, to provide any desired interior architectural effect; (*c*) combinations of sections which form any part of the inside window opening. Furnished with either standard or expanded plaster flanges.

Milcor square, projecting, or radius stools may be used in conjunction with plastered jambs with either small nose or bull nose bead, or with radius jamb and head sections. Stools, jambs, and heads may be connected with cast corner fittings welded and fitted in the factory. Formed corner fittings are also available for some sections. Complete frames or ¾ assemblies furnished for any size opening, up to 8′-0″ x 12′-0″, to fit job conditions to opening dimensions supplied by the contractor.

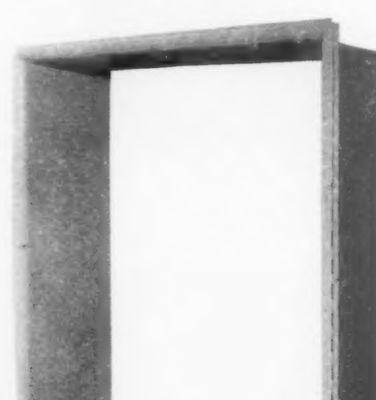


Milcor No. 501 Window Stool ¾″ Radius (*Available also with expanded flange*)

Milcor No. 521 Flat Metal Window Stool with Standard Continuous Flange (*Available also with expanded flange*)



Installation view of Milcor No. 523 Window Stool used with Milcor No. 703 Stop Mould. Note the clean-cut outline.



Milcor No. 501 Mitred and Welded Window Trim Assembly with Standard Flange

INLAND STEEL PRODUCTS COMPANY

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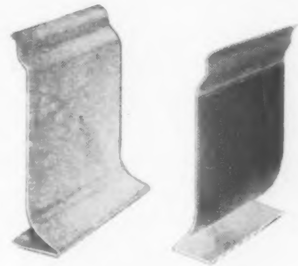
— one that combines these advantages:

- √ fire-resistance
- √ sanitation
- √ permanence of steel
- √ low maintenance cost
- √ modern appearance

Specify Milcor Metal Trim — for new construction and remodeling!

Only Milcor offers interior metal trim with a sound-deadening Insulmat lining

To help you overcome noise problems, Milcor Metal Trim is available with open areas coated with a fire-resistant asphalt composition that absorbs sound. Exhaustive tests have proved that in many cases Milcor Insulmat reduces sound reverberation as much as 90 per cent. All styles of Milcor Metal Trim are available with Insulmat Sound-Deadener, at small additional cost. (Insulmat lining is regularly furnished on Milcor Chalk Trough, without extra cost).



Insulmat is applied to the back of Milcor Metal Bases. This solidified mastic cement adheres permanently to the metal.

Milcor Metal Access Doors

Three types, with or without expanded metal wing. These permit key points in plumbing, heating, electrical, and refrigeration systems to be reached conveniently. Each style is available in details for using with all modern materials, such as plaster, masonry, brick, stone, tile, acoustical material, wallboard, etc.

Milcor Metal Bases

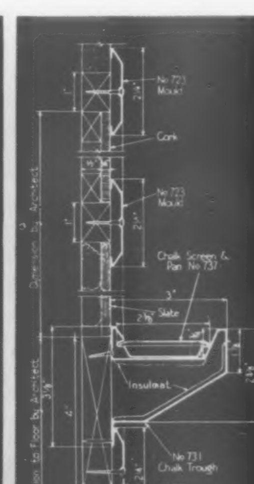
Milcor Metal Bases are available in many practical designs, sizes, and weights — in two general classifications: (1) flush or plastered-in type; (2) applied or removable type.

Milcor Metal Bases are made from tight-coat galvanized sheets of 18 and 20-gauge metal. Bases are given a protective priming coat at the factory and accept any subsequent type of painting or decorating, after plastering is completed.

Fittings for inside and outside right angles — as well as terminating points — are available.

Milcor No. 741
Chair Rail

Milcor No. 601
Metal Base
with Expansion Flange



Milcor No. 731
Chalk Trough

Milcor No. 665
Metal Base
for Solid Plaster
Partition

Milcor No. 665
Metal Base
for Masonry Wall

Write for FREE Milcor Metal Trim Catalog

INLAND STEEL PRODUCTS COMPANY

FORMERLY MILCOR STEEL COMPANY
MILWAUKEE 1, WISCONSIN

Service MILCOR Quality

KALMAN FLOOR COMPANY

110 East 42nd Street, New York 17, N. Y.

BOSTON • PHILADELPHIA • CLEVELAND • CHARLOTTE • DAYTON • CHICAGO
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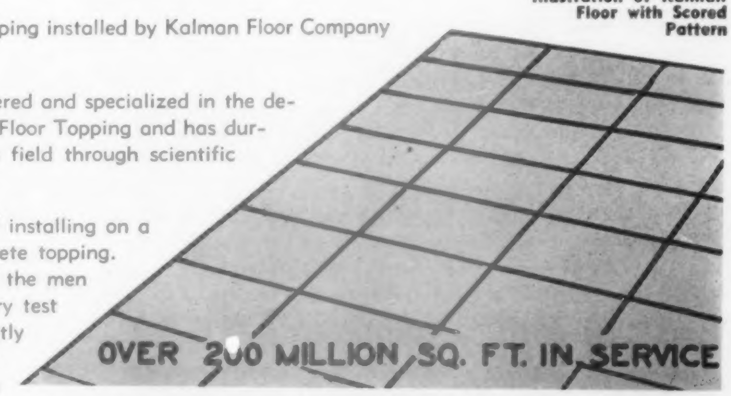
Illustration of Kalman Floor with Scored Pattern



The Kalman Floor is a granolithic cement finish floor topping installed by Kalman Floor Company using the Kalman Absorption Process.

The Kalman Floor Company has for over 30 years pioneered and specialized in the development and installation of Granolithic Cement Finish Floor Topping and has during this period maintained continuous leadership in the field through scientific research and experiments.

The Kalman Absorption Process is a practical method of installing on a commercial basis a theoretically correct low-water concrete topping. This method, combined with the skill and knowledge of the men doing the work and subjecting all materials to Laboratory test for analysis, gradation and soundness, plus a constantly growing skilled personnel and improvement in equipment has consistently produced a uniformly hard wear-resisting floor, free from disintegration and dusting and of a maximum density, evenness of texture and unexcelled durability.

Over 200 million sq. ft. of Kalman Floor is now in service throughout the United States in practically every type of Institutional, Commercial, School and Industrial building and is readily adaptable to all types of buildings where a neat appearing, sanitary, wear-resisting, dust-proof and non-slip floor is desired.

For further information, see Sweet's Architectural Catalog. A.I.A. File No. 4 i 3.

A PARTIAL LIST OF INSTALLATIONS

UNIVERSITIES

University of Alabama
Yale University, New Haven, Conn.
Howard University, Washington, D. C.
University of Illinois
Harvard University, Cambridge, Mass.
University of Virginia
University of Washington
Brown University, Providence, R. I.

COLLEGES

St. Josephs College, Hartford, Conn.
Dartmouth College, Hanover, N. H.
Connecticut State College
Martin Luther College, New Ulm, Minn.
Clemson College, Clemson, S. C.
Holy Cross College, Worcester, Mass.
St. Johns College, Brighton, Mass.
Virginia Polytechnic Institute

OTHER SCHOOLS

Chapman Technical H. S., New London, Conn.
Middletown Delaware School, Middletown, Del.
St. Angelus Parochial School, Boston, Mass.
Western High School, Baltimore, Md.
Senior High School, Gloucester, Mass.

SCOPE

In addition to Kalman Floors we install concrete fills, sanitary cement base, curbs and stairs.

Natural or standard colors.

We are also skilled in the use of crushed emery, alundum, metallic aggregates, mine tailings and such special materials where required.

We remove and replace other worn out floor finishes with new Kalman Topping.

ADVANTAGES OF KALMAN FLOORS

1. **Correct low-water cement ratio**
2. **Durability unexcelled**
3. **Maximum wear-resistance and toughness**
4. **High compressive and tensile strength**
5. **Freedom from disintegration and shrinkage**
6. **Extreme density and uniformity**
7. **Positive bond to under slab whether new or old**

RINGE TECHNICAL HIGH SCHOOL, CAMBRIDGE, MASS.

THE SANYMETAL PRODUCTS CO., INC.

1702 Urbana Road, Cleveland 12, Ohio

Sanymetal* TOILET COMPARTMENTS

Trade Mark Reg. U. S. Pat. Off.

● The Sanymetal Products Co., Inc., offers five different types of toilet compartments suitable for installation in new or existing educational buildings. They are designed and built by Sanymetal specialists with over 33 years' experience in making over 80,000 installations, and embody convenience and sanitation in a degree usually overlooked by those lacking Sanymetal's long experience in this line.

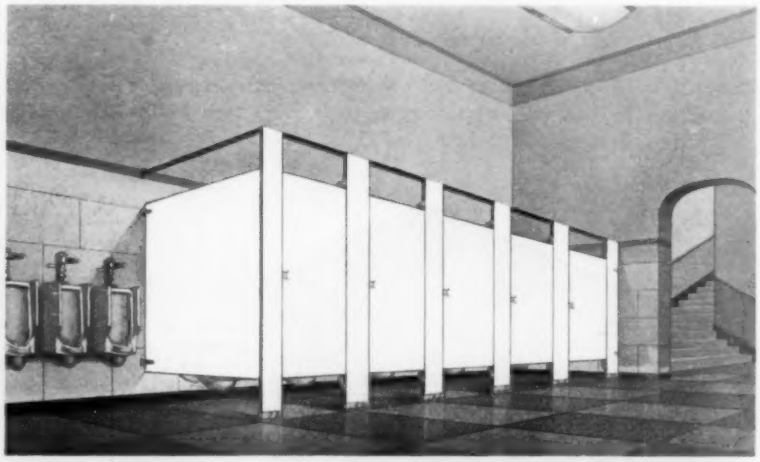
Sanymetal Toilet Compartments combine simplicity of design with sound mechanical construction in order to provide a rigid and durable installation, free from dirt-collecting pockets and ledges, and easy to keep clean. Their design and materials impart refinement and cheerfulness, and elevate the toilet room into keeping with other appointments of the building.

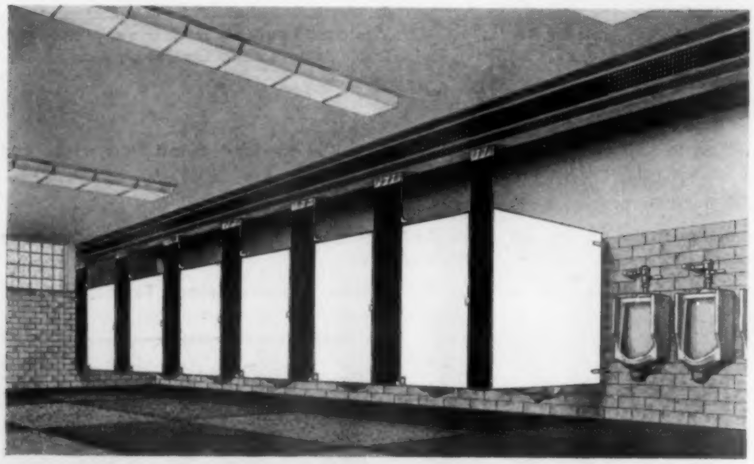
Nowhere in a school building are unwholesome tendencies more easily evident than in an unclean, outmoded toilet room, which may unconsciously influence youth to assume a careless attitude toward such matters and encourage obscenity. For this reason Sanymetal Toilet Compartments stress modernity and beauty, combined with utmost cleanliness, good taste and orderliness . . . creating a wholesome environment.

Three of the five Sanymetal Toilet Compartments described here are particularly suitable for educational buildings because they are built to stand up against the abusive treatment often accorded to such equipment.

ACADEMY TYPE TOILET COMPARTMENTS

● There's a certain refinement and distinctiveness about an installation of Academy Type Toilet Compartments that produces a wholesome atmosphere in school toilet rooms. With Flush Pilasters extending well above the doors and partitions, and united with an overhead brace of modern design, this type of compartment is the only one in which all of the dignity and distinctiveness of flush type construction, unmarred by posts, is appropriately combined with the headrail. Pilasters replacing posts and extending well above the Doors and Partitions, are flush type insulated panels. They present a flat, smooth surface on both sides that is easy to clean. Academy Type Toilet Compartments consist of just four units: Pilasters (flush front); Partitions and Door (flush type, fully insulated); and headrail assembly:—a strong, sound construction throughout. Complete specifications in Catalog 85.





CENTURY TYPE CEILING HUNG TOILET COMPARTMENTS

● Sanymetal Century Type Ceiling Hung Toilet Compartments provide an element of modernity and utility, combined with utmost cleanliness, ,that give long time assurance against obsolescence. Strikingly new in design, finish and construction. Note in the illustration that the floor is free of obstructions. This permits quick and efficient cleaning.

Basically, a Century Type Toilet Compartment consists of just three units: Pilasters (flush front) suspended from a ceiling beam; Partitions and Doors (flush type, fully insulated). Complete specifications in Catalog 85.

FINISHES AND COLORS

Sanymetal Century Type and Normandie Type Toilet Compartments illustrated above are available in two finishes: (1) "Porcena" (porcelain on steel); (2) "Tenac" (baked-on paint enamel finish over galvanized, bonderized steel). Sanymetal Academy Type Toilet Compartments are also available in baked-on paint enamel finish over regular furniture finish cold rolled steel. Toilet compartments are available in many colors. For further information consult with a Sanymetal representative or write direct to the factory

SANYMETAL "PORCENA" (*Porcelain on Steel*) TOILET COMPARTMENTS

To be sure of strictly modern toilet room environments use this ageless material

● SANYMETAL "PORCENA" (porcelain on steel) presents a correct combination of the desirable qualities of the hardness of glass and the strength of steel. This ageless and fadeless material provides the utmost in sanitation, protection against obsolescence and a certain elegance and beauty that is otherwise unobtainable.

● SANYMETAL "PORCENA" (porcelain on steel) Toilet Compartments are particularly appropriate for installation in educational buildings as their sturdiness and ageless finish withstands shocks and hard usage without injury to the smooth lustrous surface. Sanymetal "Porcena" (porcelain on steel) is impervious to odors, moisture, ordinary acids, oils and grease, and is rustproof. It is as easy to keep clean as wiping the kitchen range, as the finish is non-porous and flint-hard. It discourages the common inclination to disfigure toilet room equipment.

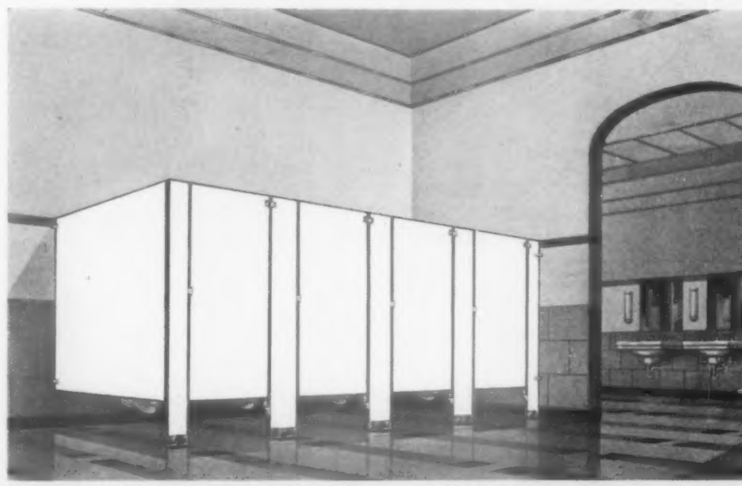
● SANYMETAL "PORCENA" (porcelain on steel) Partitions and Doors are Flush Type, insulated, and approximately 1-inch thick. Each partition panel and door is formed by assembling two sheets of porcelain finished steel to a rigid, dense, sound-deadening ⅞-inch insulating core. Thus, a partition panel or door is formed *that greatly exceeds the usual resistance to damaging blows*, of other materials commonly used for toilet compartments.

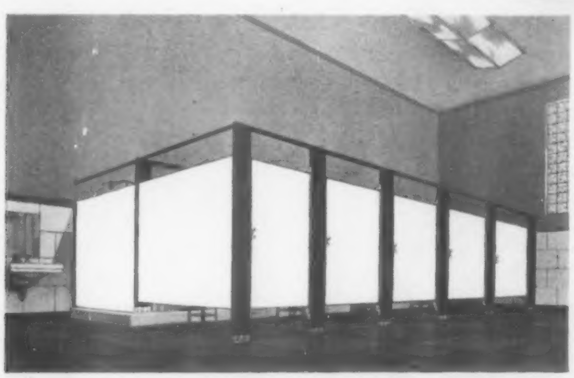
● SANYMETAL "PORCENA" (porcelain on steel) is indeed the ageless material that always stays new, and cannot be surpassed by any other existing material from the standpoint of sanitation and maintenance. Complete description of Sanymetal "Porcena" in Catalog 85.

NORMANDIE TYPE TOILET COMPARTMENTS

● A streamline effect is moderately imparted to a toilet room environment when Normandie Type Toilet Compartments are installed. Pilaster tops on the same horizontal plane as the tops of Partitions and Doors give the true streamline effect.
Through skillful Pilaster design and construction and manner of fastening Pilasters to the floor, a degree of rigidity is obtained that is fixed and permanent.

Normandie Type Toilet Compartments consist of just three units: Pilasters (flush front), Partitions and Doors (flush type, fully insulated): a simple, mechanically correct construction. Complete specifications in Catalog 85.





SANYMETAL "PORCENA" SHOWER STALLS AND DRESSING ROOM COMPARTMENTS

● Shower stall installations, with or without dressing rooms, when built of Sanymetal "Porcena" (porcelain on steel) Partitions, Doors and Pilasters, encourage those who use these facilities to cooperate in keeping them orderly and neat. Their hard, flint-like surface does not absorb heavy odors. The residue of shower bathing that would ordinarily adhere to the surface of partitions and doors does not adhere to the smooth, glistening porcelain enamel surfaces. With as little effort as it takes to keep the porcelain surfaces of household appliances sweet and clean, these Partitions and Doors can be kept strictly sanitary.

OTHER SANYMETAL PRODUCTS FOR SCHOOL AND EDUCATIONAL INSTITUTIONS

● Sanymetal provides a wide range of accessory equipment for furnishing toilet and washrooms in school and educational buildings. These products include: Shower Cabinets, Several Types; Dressing Room Compartments; Utility Enclosures; Entrance Screens; Janitors' Closets; and "Porcena" Wainscot for wall treatments. Complete specifications in Catalog 85.

NAILOCK STEEL NAILING CHANNELS

● Nailock Nailing Channels provide a new method for attaching accoustical materials, tile, panels, slabs, sheets and other kinds of covering, flat or corrugated, in fact any nailable material, over steel or concrete. The method is as simple and safe as it is permanent and economical.

For further information contact the Engineering Department, Nailock Steel Division, The Sanymetal Products Co., Inc.

THE SANYMETAL PRODUCTS CO., INC.

1702 Urbana Road CLEVELAND, OHIO

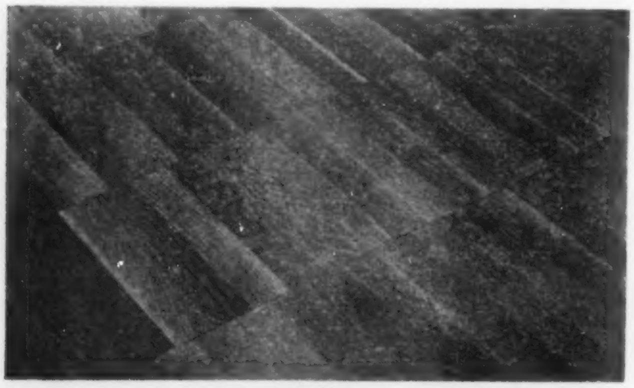
Inquiries "East of Pittsburgh" address to
STORM FLOORING CO., INC.
2500 Park Avenue, New York 51, N. Y.
Telephone MOtt Haven 9-2700

Inquiries "West of Pittsburgh" address to
ROBBINS FLOORING COMPANY
Box 59, Rhinelander, Wis.
and Ishpeming, Mich.

Ironbound

MAPLE FLOORS Interlocked

The "Continuous Strip" pattern combines the UNIFORMITY of parquet with the SIMPLICITY of ordinary strip flooring. It WEARS evenly and never bulges unless exposed to abnormal moisture. The illustration below shows its appearance in a floor.



SPECIFY

IRONBOUND flat-grain 25/32" or 33/32" thick for upper floors, 2½" wide, generally 12" long, second and better grade, laid in trowelled mastic.

LEVELING—If laid over worn or uneven concrete, the underfloors shall be leveled with IRONBOUND Leveling Compound.

WATERPROOFING—On ground slab or over unexcavated or improperly ventilated spaces, provide one or more layers of asphalt saturated felt laid in cold-troweled mastic.

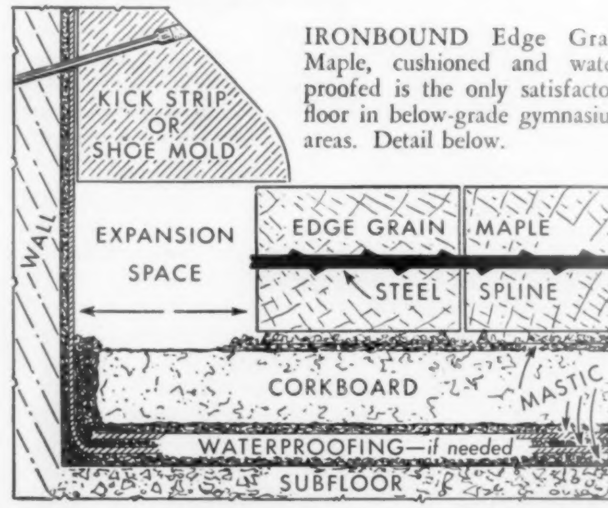
IRONBOUND EDGE GRAIN MAPLE—For on-grade and below-grade installations, specify 33/32" thick IRONBOUND edge-grain maple, face widths from 1⅛" to 1¾" at mill's option, generally 12" long, second and better grade.

FINISHING—In classrooms apply two coats of IRONBOUND penetrating sealer, clear, buffed with steel wool. In gymnasiums apply one coat of IRONBOUND penetrating sealer (in preparation for court markings and final coats of finish applied by others).

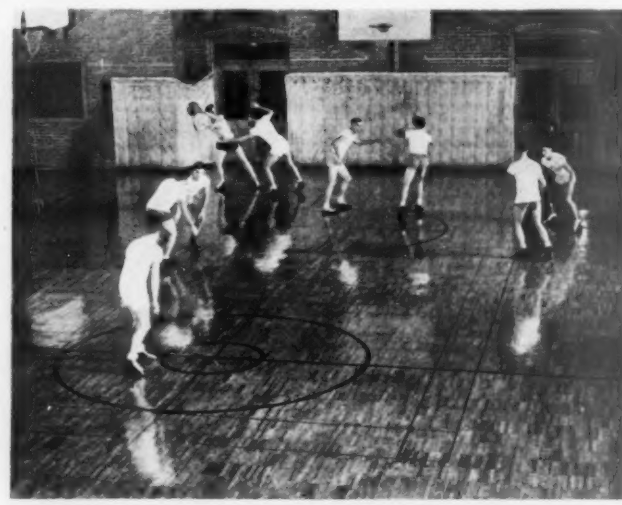
EXPANSION—Provide expansion space at walls, columns, doorways, etc., covered by moldings, saddles, etc., installed by others.

GUARANTEE—Two-year guarantee is furnished by the floor contractor installing IRONBOUND floors. It covers defects in material and workmanship and also disruption of the floor due to seasonal humidity.

IRONBOUND edge-grain maple laid over two-ply membrane waterproofing in basement gymnasium — Manhasset, L. I., grade school.



IRONBOUND Edge Grain Maple, cushioned and waterproofed is the only satisfactory floor in below-grade gymnasium areas. Detail below.



IRONBOUND edge-grain maple laid over resilient corkboard in basement gymnasium of State Teachers College, Cortland, N. Y.

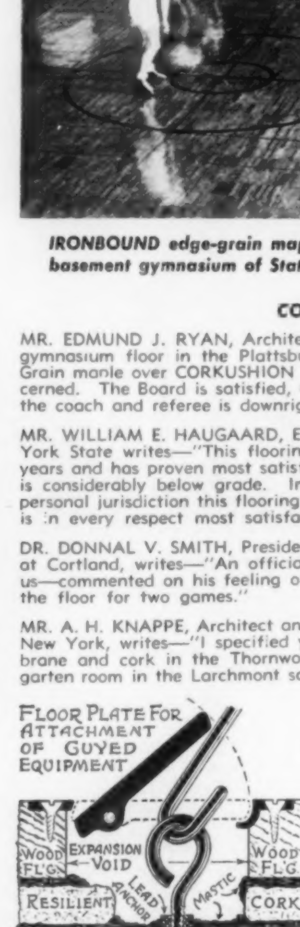
COMMENTS

MR. EDMUND J. RYAN, Architect, of Plattsburg, N. Y., writes—"The gymnasium floor in the Plattsburg High School of IRONBOUND Edge Grain maple over CORKUSHION has given satisfaction to everyone concerned. The Board is satisfied, I am satisfied, and Mr. Frank E. Miller the coach and referee is downright enthusiastic."

MR. WILLIAM E. HAUGAARD, Ex-Commissioner of Architecture of New York State writes—"This flooring has now been in service for several years and has proven most satisfactory, although the floor of the room is considerably below grade. In another school gymnasium under my personal jurisdiction this flooring was installed upon a cork-cushion, and is in every respect most satisfactory."

DR. DONNAL V. SMITH, President of New York State Teachers College at Cortland, writes—"An official voluntarily—without suggestion from us—commented on his feeling of freshness after running up and down the floor for two games."

MR. A. H. KNAPPE, Architect and School Specialist, 192 Lexington Ave., New York, writes—"I specified your Edge Grain maple laid over membrane and cork in the Thornwood school gymnasium; a large kindergarten room in the Larchmont school; and a dining room in the Greenburgh school—TWO IN BASEMENT AREAS—and the results have been highly satisfactory."



IRONBOUND products are covered by U. S. Patents 1,864,744; 1,940,377; 1,946,646; 2,026,511; and others pending.

CLASSROOM, PEABODY DEMONSTRATION SCHOOL, NASHVILLE, TENN.

TILE-TEX ASPHALT TILE FLOORING

A Time-Tested School Flooring

Tile-Tex Asphalt Tile is an asbestos-asphalt composition tile flooring, which has been used for twenty years in schools throughout the United States. Tile-Tex Asphalt Tile floors give uniformly good service, represent on the average a low investment cost per square foot, and are maintained simply and economically. They represent what we honestly believe to be the greatest value in floors for schools that can be purchased today.

Tile-Tex Asphalt Tile is designed and manufactured to meet the demand for a low cost flooring, installed in tile size units, that will withstand heavy foot traffic under exacting conditions over a long period of years. Prominent school architects throughout the nation specify Tile-Tex Asphalt Tile consistently and know from experience that the company manufacturing it can be relied upon to stand behind the material and improve it year after year.

On these pages are photographs showing Tile-Tex Asphalt Tile in use in many of the various types of areas found in schools today. Tile-Tex Asphalt Tile is often specified because of this versatility and adaptability to a wide variety of uses. It is manufactured in a great variety of sizes and colors, enabling the creation of designs to suit almost any color scheme and design objective. Hundreds of Tile-Tex Asphalt Tile installations in schools throughout the country are mute testimony to the quality of the product and the knowledge and skill of the Tile-Tex Asphalt Tile contractors who install it.

Constructive criticism and suggestions on the part of school executives are always welcomed by the company, which is constantly ready to help in the solution of any problems connected with school floors.

CLASSROOM, RIVERHEAD HIGH SCHOOL, RIVERHEAD, N. Y.

Ideal for Work or Play

Low Maintenance Cost

LOUNGE, WILLARD HALL, NORTHWESTERN UNIVERSITY, EVANSTON, ILL.

TILE-TEX ASPHALT TILE FLOORING

Durable
Sanitary
Attractive

TILE-TEX ASPHALT TILE FLOORS ARE SAFE, ATTRACTIVE, DURABLE, AND EASY TO CLEAN. THESE CHARACTERISTICS ARE PARAMOUNT IN SCHOOL CORRIDORS

THE ATTRACTIVE TILE-TEX ASPHALT TILE FLOOR SHOWN BELOW LENDS CHARACTER AND DISTINCTION TO THIS LIBRARY

"Foot-easy"

THIS HOME ECONOMICS ROOM FLOOR IS COMFORTABLE UNDER FOOT AND HAS A SANITARY, EASY-TO-CLEAN SURFACE

TILE-TEX ASPHALT TILE FLOORING

Meets Requirements in All Areas

Tile-Tex Asphalt Tile possesses the necessary performance characteristics required for school corridors, classrooms, restrooms, auditoriums, libraries, science rooms, cafeterias, and offices. Tile-Tex Asphalt Tile combines comfort under foot with the ability to withstand severe traffic and give many years of satisfactory service. Inherently moisture-resistant, Tile-Tex Asphalt Tile is successfully installed in areas on and below grade over concrete sub-floors. When unwaxed, Tile-Tex provides a safe, sure footing on which to walk and work. Its smooth, closely textured surface is easy to keep clean and sanitary. The asbestos content of Tile-Tex Asphalt Tile makes it substantially incombustible and places it high in the ranks of resilient flooring as to fire resistance.

Tile-Tex Asphalt Tile is available in thirty-six plain and marbleized colors. Careful designing of these colors enables the judicious selection of colors to meet specific requirements of each school area.

Tile-Tex Asphalt Tile is manufactured in two thicknesses, 1/8" and 3/16", and in the following sizes: 3 x 3 in., 6 x 6 in., 6 x 12 in., 9 x 9 in., 12 x 12 in., 12 x 24 in., and 18 x 24 in. To supplement these sizes and permit modern, striking designs, there are available feature strips in multiples of 1/2 in., from 1 in. to 3 in. Special decorative inserts for achieving individuality of design are also obtainable.

Partial List of School Installations

The Franklin D. Roosevelt High School, Bremerton, Washington
Cornish School, Seattle, Washington
Lake City Grade School, Seattle, Washington
Newburyport High School, Newburyport, Massachusetts
Duxbury High School, Duxbury, Massachusetts
Davol School, Fall River, Massachusetts
Bowditch School, Salem, Massachusetts
Providence St. School, Worcester, Massachusetts
Howard University, Washington, D. C.
Georgetown University, Washington, D. C.
Lee Jackson School, Fairfax County, Virginia
St. Paul's Academy, Washington, D. C.
Leland Junior High School, Bethesda, Maryland
Catonsville High School, Catonsville, Maryland
Johns Hopkins University, Baltimore, Maryland
St. Mary's High School, Akron, Ohio
Akron University, Akron, Ohio
Barbarton High School, Barbarton, Ohio
Boy's Catholic High School, North Side, Pittsburgh, Pennsylvania
The Cranbrook School, Detroit, Michigan
York School, Dearborn, Michigan
University of Detroit, Detroit, Michigan
University of Michigan, Ann Arbor, Michigan
Dominican High School, Detroit, Michigan
University of Pittsburgh, Pittsburgh, Pennsylvania
Carnegie Tech, Pittsburgh, Pennsylvania
Toledo University, Toledo, Ohio
Del Barton School, Morristown, New Jersey
Sacred Heart Academy, Stamford, Connecticut
Holy Trinity School, Brooklyn, New York
Blair Academy, Blairstown, New Jersey
Mt. Carmel School, Utica, New York
Mattituck School, Mattituck, New York
Port Washington High School, Port Washington, New York
New York University, New York, New York
Ethel Walker School, Simsbury, Connecticut
Washington Irving High School, New York, New York
St. Vincent's School, Buffalo, New York
Scarsdale High School, Scarsdale, New York
University of Connecticut, Storrs, Connecticut
Point Loma Junior High, San Diego, California
San Diego Army-Navy Academy, Carlsbad, California
Grossmont Union High, Grossmont, San Diego County, California
El Monte Union High School, El Monte, California
Thomas A. Edison School, Long Beach, California
Huntington School, San Marino, California
Riverside Drive School, Van Nuys, California
United Township High School, East Moline, Illinois
Milan Public School, Milan, Illinois
Augustana College and Theological Seminary, Rock Island, Illinois
University of Illinois, Champaign, Illinois
Illinois Institute of Technology, Chicago, Illinois
George Williams College, Chicago, Illinois
Hinsdale Township High School, Hinsdale, Illinois
Bloom Township High School, Chicago Heights, Illinois
University of Florida, Gainesville, Florida
Florida State Teachers, Tallahassee, Florida
Emery University, Emery, Georgia
Louisiana State University, New Orleans, Louisiana
University of Oklahoma, Norman, Oklahoma
Washington University, St. Louis, Missouri

THE TILE-TEX COMPANY, INC.
ASPHALT TILE MFR.
CHICAGO HEIGHTS, ILLINOIS
SUBSIDIARY OF THE FLINTKOTE COMPANY

THOS. MOULDING FLOOR MFG. CO.

EXECUTIVE OFFICES

165 West Wacker Drive, Chicago 1, Ill.

DISTRICT SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

THOS. MOULDING Moultile

Flexible Reinforced
MASTER ASPHALT TILE

Moultile Master Asphalt Tile combines all the qualities desirable for school floors. It is highly decorative. The sparkling, fresh colors have clarity and depth of tone, and the subtly interwoven veining creates a pleasantly variegated appearance.

Moultile is quiet underfoot, and has a pleasant resilience and elasticity. It is low in original cost, and exceptionally low in maintenance cost.

Durability is an outstanding characteristic of Moultile Asphalt Tile. Millions of scuffing, scraping feet will cause no perceptible wear . . . will not affect color and texture which are uniform throughout. Moultile, therefore, requires no expensive periodic refinishing.

Moultile is ideal for classrooms, corridors, and lobbies. In gymnasiums it yields a secure footing which does not tire contestants or cause floor burns and may quickly be waxed for dancing.

Reinforced for Extra Strength

Because of its strength Moultile can now be applied, even in the ⅛ inch thickness, over firm, smooth wood sub-floors with results heretofore expected only of asphalt tile over cement. It is truly inert and remains permanently bonded to sub-floor. Because of its flexibility, Moultile quickly seats itself to the underfloor, permitting immediate use after installation.

Ideal for Basement Floors

Moultile and the asphalt cement in which it is laid are impervious to the alkali and dampness always present in cement resting on the ground, which destroy other types of flooring. Moultile bonds permanently, does not buckle or loosen and will not rot or decompose. It solves the problem of flooring over cement resting on the ground.

Many Colors and Sizes

Moultile is available in twenty rich colors, plain and marbleized. Thicknesses: ⅛ or 3/16 inch. Sizes: 9 x 9, 12 x 12, and 18 x 24 inches.

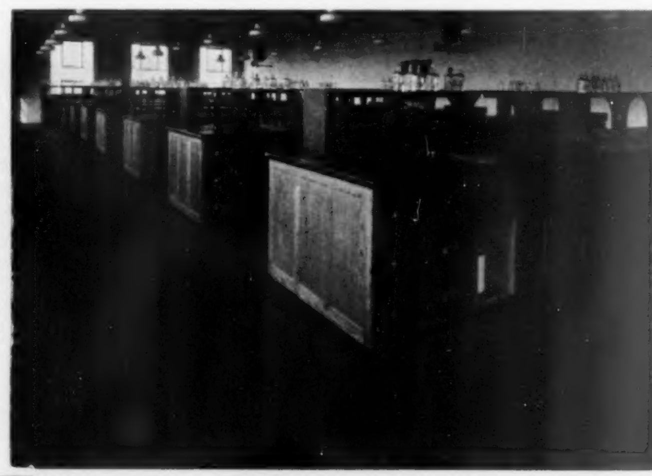
Architectural beauty distinguishes University of Maryland interiors as well as the exteriors. Moultile flooring has now been installed in 11 campus buildings. The most recent of these is Dormitory No. 2, pictured above. Henry Hopkins, architect; Southeastern Floor Co., Hyattsville, Md., contractors.

THOS. MOULDING Greaseproof TILE

Thos. Moulding Greaseproof Tile resists the grease and oils that discolor and soften other floor coverings. It is ideal for domestic science rooms, kitchens, cafeterias, and machine shops. This flooring has the same resilient buoyancy, the same high strength and other characteristics of Moultile.

THOS. MOULDING Acid-Resistant TILE

Thos. Moulding Acid-Resistant Tile is a specially formulated Moultile for giving maximum resistance against acidic and alkaline chemicals which are harmful to other types of floor coverings. It is recommended for laboratory installation and for lavatories. It has all the other characteristics of Moultile . . . durability, underfoot comfort, etc.



In this typical chemistry laboratory at State Agricultural College, Raleigh, N. C., Thos. Moulding Acid-Resistant Tile repels chemical attack and provides a sturdy floor which is comfortable underfoot and easily kept clean

PRODUCTS OF Thos. Moulding

Floors, Walls, Treads, Trim . . . ***from Plastics***

FLOORS

Tile

- Moultile
- Greaseproof
- Acid-Resistant
- Chemproof
- Non-slip Safety

Troweled-on

- TMB
- Moulstone
- Marbletred
- Asphalcrete Underlayment
- Magnesite Underlayment

WALLS and WALL BASES

- Moultile Walls
- Greaseproof Walls
- Acid-Resistant Walls
- Flexible Cove Base

PLASTIC SPECIALTIES

- Moultread Stair Tread and Nosing
- Flexedging
- Shuffle Board Patterns

MAINTENANCE MATERIALS

- Permagloss Self-polishing Wax
- Sweepolene Sweeping Compound
- Kleenolene Non-caustic Soap

INSTALLATION—Approved flooring contractors contract to install Thos. Moulding floors anywhere in the United States and nearby countries. Write for samples and complete technical information on Moultile and the Company's other products, listed above.

THOS. MOULDING

Safety Tile

Provides positive, non-slip underfoot safety, even when wet.

Thos. Moulding Safety Tile is a floor tile in which non-slip chips, incorporated during the manufacturing process, positively eliminate the slip hazard, even when the floor is wet and also provide greater resistance to wear. Thos. Moulding Standard Safety Tile has all the other characteristics of Moultile and is similarly installed. It is also available in the Acid-Resistant and Greaseproof types.

Thos. Moulding Safety Tile is now widely used in front of elevators, on stair treads, under revolving doors, and in vestibules, stair entrances, ramps, etc., wherever safety is essential, and wherever exceptional durability is called for.

In this gymnasium at the Moorhead, Minn., Junior High School, the Moultile floor continues in excellent condition after 10 years' usage. The game lines are inlaid with Moultile in contrasting colors . . . never fade, never need repainting

At the Monroe School, Davenport, Iowa, Thos. Moulding Flexible Base, installed at the base of the lockers, takes the kicking and bumping in stride. The floor is Moultile. Childs & Smith, architects; Kruse & Parish assoc. architect

THOS. MOULDING

Flexible Base

ON-TOP COVE TYPE

Thos. Moulding Cove Base is a highly decorative, economical, sanitary wall trim. It is made from the same type of materials as Moultile flooring, and is therefore characterized by the same inherent durability and everlasting beauty. The Base is available in a deep, lustrous black, and also in the full range of Moultile colors. It is widely used for a sanitary juncture with every type of flooring . . . asphalt tile, linoleum, linoleum tile, rubber, cork, wood, cement or terrazzo.

This Base is made exceptionally strong. The sturdy toe and wall section withstand the kicking and bumping unavoidable in maintenance. So flexible is the Base that merely warming it on the back makes it conform readily to wavy walls and go easily around circular or square pilasters. Similarly the Base can be bent around corners, both internal and external, so neatly and easily that separate corner pieces are not needed. Due to its flexibility, the Base conforms to the slight irregularities which exist in most sub-floors. The toe need merely be warmed and pressed into continuous contact with the floor.

Thos. Moulding Base is low in original cost and low in upkeep cost. The only backing needed is a smooth plaster wall. Expensive wood grounds are not required. No initial finishing and no periodic refinishing is ever necessary.

THOS. MOULDING

Moulstone

COMPOSITION FLOORING

Thos. Moulding Moulstone is a plastic trowelled-on composition to form a smooth, seamless, sanitary surface. Because of its great strength, Moulstone is especially valuable for converting old wood floors . . . even those in poor condition . . . into new floors which are safe, attractive, comfortable and easily kept clean. The usual application raises existing floor levels only ½ inch and adds little weight.

Moulstone is low in cost, and ready for use almost immediately. It can be paneled and banded in different color combinations or scored to resemble tile. Moulstone is fireproof and resists oil and grease.

Moulstone has the unusual property of inhibiting development of the fungus which causes athlete's foot. It is therefore recommended for use in locker rooms, toilets and showers. Available in five attractive colors and black.

THOS. MOULDING

Underfloor

TREATMENTS

Virtually any old cement or wood floor, no matter how bad its condition, can be made into a suitable foundation for floor coverings through the application of Thos. Moulding Asphalcrete and Magnesite Underlayments and Quick-smoother. These materials have been specially developed by Thos. Moulding to smooth and strengthen sub-floors that are cupped, cracked, uneven or springy.

Thos. Moulding also specializes in the repair of magnesite and mastic floors.

MAINTENANCE MATERIALS

Good floors deserve good care. The following maintenance materials, specially developed for use on Moultile, are recommended as being safe, efficient and economical for use on all floor coverings.

Permagloss—A bright-drying, self-polishing liquid floor wax which contains no oil, grease or other harmful solvents.

Kleenolene—A non-caustic liquid soap which will not injure floors or finishes.

Sweepolene—A sweeping compound made with wax instead of the oil found in commercial compounds.

SERVICISED PRODUCTS CORPORATION

6051 West 65th St., Chicago 38, Ill.

SERVICISED SAFETY TREADS AND SAFETY FLOORING

Specifications based on sound Safety Engineering principles should never be rejected as a means of economy. The school's responsibility for providing non-slip walkways for the safety of children and teachers has been well established.

This responsibility can be discharged by the usage of SERVICISED Safety Treads and Flooring thus providing a non-slip material that functions efficiently under any condition.

True economy is gained by the provision of permanent safety-under-foot for the longest possible time, thereby reducing accidents, accident claims and the necessity for premature replacement of the non-slip material. SERVICISED Safety Treads and Flooring possess the resilient qualities of rubber to which the abrasive resistance and anti-slip quality of Alundum has been added. Safety Treads are made in widths of 3″ to 14″ and any length. Safety Flooring is available in 36″ x 96″ sheets and 9″ x 9″ or 12″ x 12″ tiles.

NOW MADE MORE RESILIENT

Cork Sheets

Sponge Rubber

Rubberized Asphalt

Side Walk Joint

Caulking Material

SERVICISED
QUALITY PRODUCTS
1920

Abrasive Flooring

Construction Joint Material

Vertical Joint Seal

Court and Swimming Pool Waterproofing

Para-Plastic Sealing Compound

SERVICISED PRODUCTS CORPORATION
6051 West 65th Street
Chicago 38, Illinois

Write for Catalogs Describing SERVICISED Flooring and Construction Materials

AMERICAN ABRASIVE METALS CO.

IRVINGTON 11, N. J.

Offices in Principal Cities

ANTI-SLIP PRODUCTS FOR FLOORS, RAMPS AND WALK-WAYS

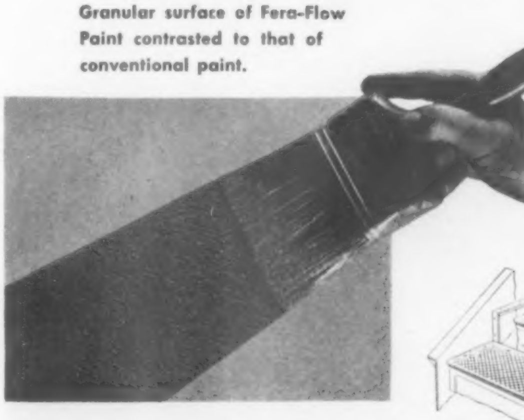
FERROX—*THE ANTI-SLIP TROWELING COMPOSITION*

For Shower Stalls
For Swimming Pools
For Industrial Art Departments

Here is a very economical, yet completely satisfactory solution to foot-traffic slipping hazards. FERROX Anti-Slip Troweling Composition is a synthetic resin containing anti-slip particles. An important feature is ease of application. It is trowelled on cold, right from the container. Under normal conditions it is ready for use in six to eight hours. One gallon in two thin coats covers approximately 35 square feet. Colors available—Red, Dark Blue, Gray and Black. Schools have found this product particularly satisfactory in the Industrial Arts Departments, around machines and work benches, in shower stalls and wash rooms and around swimming pools, and in kitchen areas and cafeterias.

FERA-FLOW—*THE ECONOMICAL ANTI-SLIP PAINT*

Granular surface of Fera-Flow Paint contrasted to that of conventional paint.



Anywhere that floor paint can be used, FERA-FLOW Anti-Slip Floor Paint will give excellent surface protection—PLUS safety from slipping. It is high grade paint containing specially prepared non-slip particles.

ADDITIONAL ANTI-SLIP PRODUCTS BY THE MAKERS OF FERALUN STAIR TREADS

FERALUN Anti-Slip abrasive stair treads have long been the standard for school and other public buildings. Over 20,000 Feralun Stair Treads were furnished for schools in a single year. Other products are anti-slip abrasive tile, and abrasive safewalk fabric. Write for complete information describing these products.

WE HAVE THE RIGHT PRODUCT TO CORRECT YOUR SLIPPING HAZARD . . . WRITE US GIVING DETAILS OF YOUR PROBLEM

AMERICAN MASON SAFETY TREAD CO.

Lowell, Mass.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

MASON

Abrasive Metal — Ribbed Type — Universal
SAFETY TREADS

For Stairways, Stair Landings and Ramps

Over Fifty Years of Service to Educational Institutions

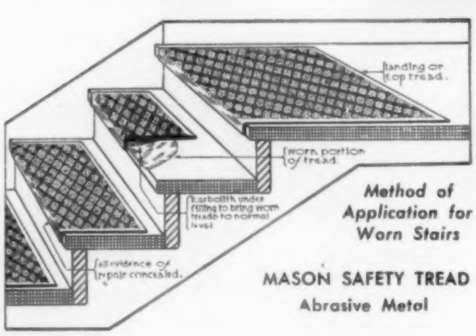
Plans for extensive school building repairs being formulated include many stairways, entrances and other heavy-traffic walkway surfaces on which repairs have been necessarily neglected during the period of materials restriction.

For years **Mason Safety Treads** have filled a very definite need on stairways and other surfaces preventing serious accidents. With Mason Treads, whether you install the Abrasive Metal, the Ribbed Type in Brass or Aluminum, or

Universal, your SAFETY problem will be satisfactorily solved. All types can be quickly and economically installed by your own workmen.

When you specify MASON products, you are assured of receiving *individualized* attention to y o u r particular problem, intelligent engineering service, and a quality product at a fair price.

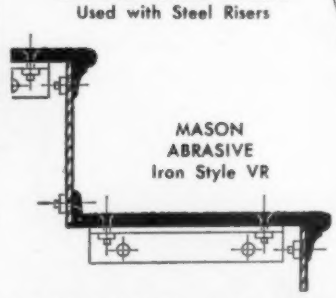
Write for copy of the MASON catalog—sent free on request to any school official or architect.



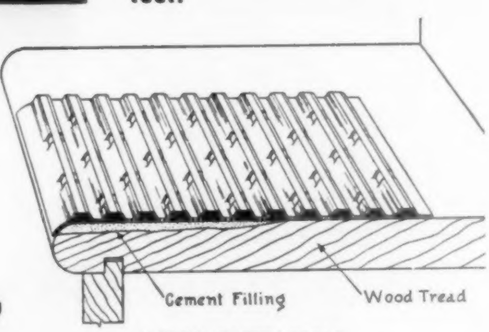
Method of Application for Worn Stairs

MASON SAFETY TREAD
Abrasive Metal

Above and Below—
SELF-SUSTAINING TREADS
Used with Steel Risers



MASON
ABRASIVE
Iron Style VR



MASON SAFETY TREAD
Universal Type

SPECIFICATIONS — SAFETY TREADS

New Steel Construction — All stair treads and platforms as shown on plans shall be Mason Abrasive Iron Style VR (or other style as selected) with cross-hatched (plain or fluted if preferred) surface as manufactured by the American Mason Safety Tread Co., Lowell, Mass. Suitable steel supports and stringers with carrier angles shall be provided for securely bolting treads and platforms in place. Sheet steel riser plates (state gauge) shall be bolted to nosings and riser lips of the Safety Tread. Thickness of treads and platforms shall conform to the manufacturer's established standards.

New Concrete or Pan Filled Construction — All stair treads including floor and landing level steps shall be provided with Mason Abrasive Iron Safety Treads Style M (H or G) cross-hatched surface as manufactured by the American Mason Safety Tread Company, Lowell, Mass. (Mason Universal Type II, Style B Safety Tread, steel with lead inserts, may be substituted.) Safety Treads shall be 3" wide (minimum)—and extend from stringer to stringer (for reinforced concrete construction safety treads may extend to within 3 inches of stringers). Standard concrete anchors, spaced according to manufacturer's recommended practice, shall be used to secure safety treads in place.

TYPICAL MASON EDUCATIONAL INSTALLATIONS

HARVARD UNIVERSITY
Cambridge, Mass.
MONTREAL WEST HIGH SCHOOL
Montreal, P. Q.
BROWN UNIVERSITY
Providence, R. I.

PROVINCIAL NORMAL SCHOOL
Fredericton, N. B.
CULVER MILITARY ACADEMY
Culver, Indiana
UNIVERSITY OF MINNESOTA
Minneapolis, Minn.

U. S. MILITARY ACADEMY
West Point, N. Y.
U. S. NAVAL ACADEMY
Annapolis, Md.
UNIVERSITY OF FLORIDA
Gainesville, Fla.

PRINCETON UNIVERSITY
Princeton, N. J.
LOUISIANA STATE UNIVERSITY
Baton Rouge, La.
WILLIAMS COLLEGE
Williamstown, Mass.

AND HUNDREDS OF OTHERS

WOOSTER PRODUCTS, INC.

36 Spruce Street

Wooster, Ohio, U. S. A.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Safety Treads · Elevator Sills · Window Sills · Curb Bars ·

Free Footsteps From Fear With WOOSTER *Safety Treads*

Over 16% of All Student Accidents in School Buildings Occur on Stairs

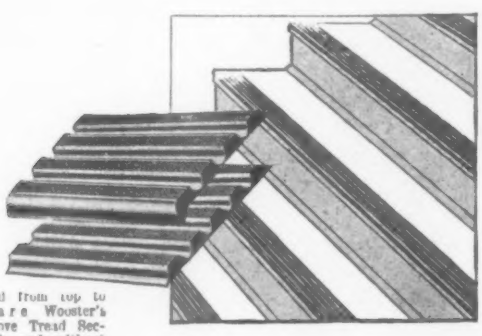
Out of an experience extending well over 20 years, Wooster Products, Inc., has furnished Safety Treads for over 86,000 installations, hundreds of which have been in educational buildings and stadiums. Wooster Engineers have designed a Wooster Safety Tread to meet every requirement of safety, economy and beauty to a degree usually overlooked by those lacking Wooster's long experience.

IN NEW BUILDINGS INSTALL WOOSTER SAFETY TREADS ON STAIRS AND RAMPS FOR

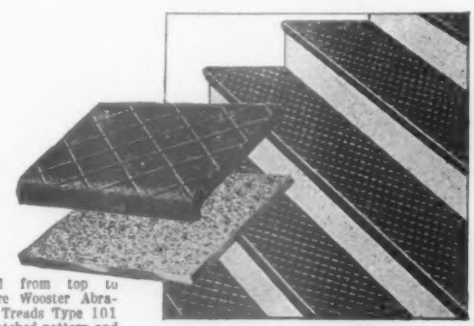
Safety—**Safety should be the first consideration in the design of any walkway. Wooster Safety Treads have been designed to lessen all slipping hazards. Laboratory tested materials are used to provide the highest degree of anti-slip protection possible. Wooster Safety Treads are not ordinarily affected by water, oily substances or icing.**

Appearance—**Wooster Safety Treads give assurance that there will be no ugly down-at-the-heel appearance to stairs or other walkways, even after considerable wear. Wooster Treads add materially to the attractiveness of all stairs—even the beauty of such fine materials as marble.**

Economy—**Safety is priceless. The first cost of Wooster Safety Treads is a mere fraction of a percent of the total cost of a building. Yet the installation of Wooster Safety Treads may save thousands of dollars by preventing injuries due to falls. The hard, wear-resistant, anti-slip properties endure with little or no care for many years and are easily replaced if ever worn out.**



Illustrated from top to bottom are Wooster's Safe Groove Tread Sections with and without nosing.



Illustrated from top to bottom are Wooster Abrasive Cast Treads Type 101 in cross-hatched pattern and Type 100 in plain pattern.

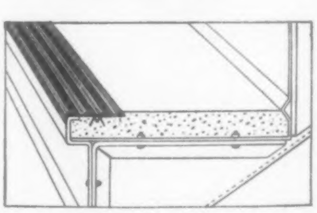
WOOSTER SAFE-GROOVE TREADS

These treads made of steel, yellow brass or white alloy bases give stairways an ultra modern appearance that is unsurpassed in appearance. Positive anti-slip protection is furnished by either an abrasive filler with grits embedded not less than 1/16 inch, or by a lead filler which has long been recognized as an ideal safety tread material. These treads are as well suited for repairing stairs as for new stairways.

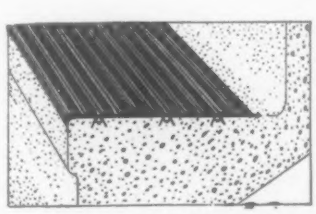
WOOSTER ABRASIVE CAST TREADS

Wooster Abrasive Cast Treads are built for durability and require little maintenance. Abrasive grit is integrally cast into the metal matrix to a minimum depth of 1/16 inch and is unaffected by oil, soap or other lubricants. These treads are made in four different metals. Ferrogrit (Cast Iron) Safety Treads are cast from high grade iron of pearlitic structure developed after years of metallurgical research and especially suitable for safety tread service. Other safety tread materials are Bronzogrit (bronze), Alumogrit (aluminum) and Nicklo grit (nickel).

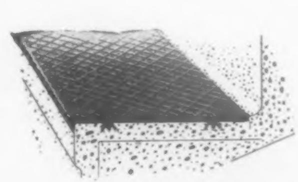
APPLICATIONS



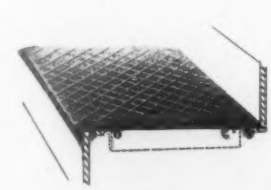
Steel Sheet Pan Stair with Wooster Safe-Groove Tread, Nosing Section No. 46.



Concrete Stair with Wooster Safe-Groove Tread, Nosing Section No. 40 and Flat Section No. 42.



Concrete Stair equipped with Type 103 Wooster Abrasive Cast Full Width Tread, cross-hatch, surface, with ¾" Nosing.

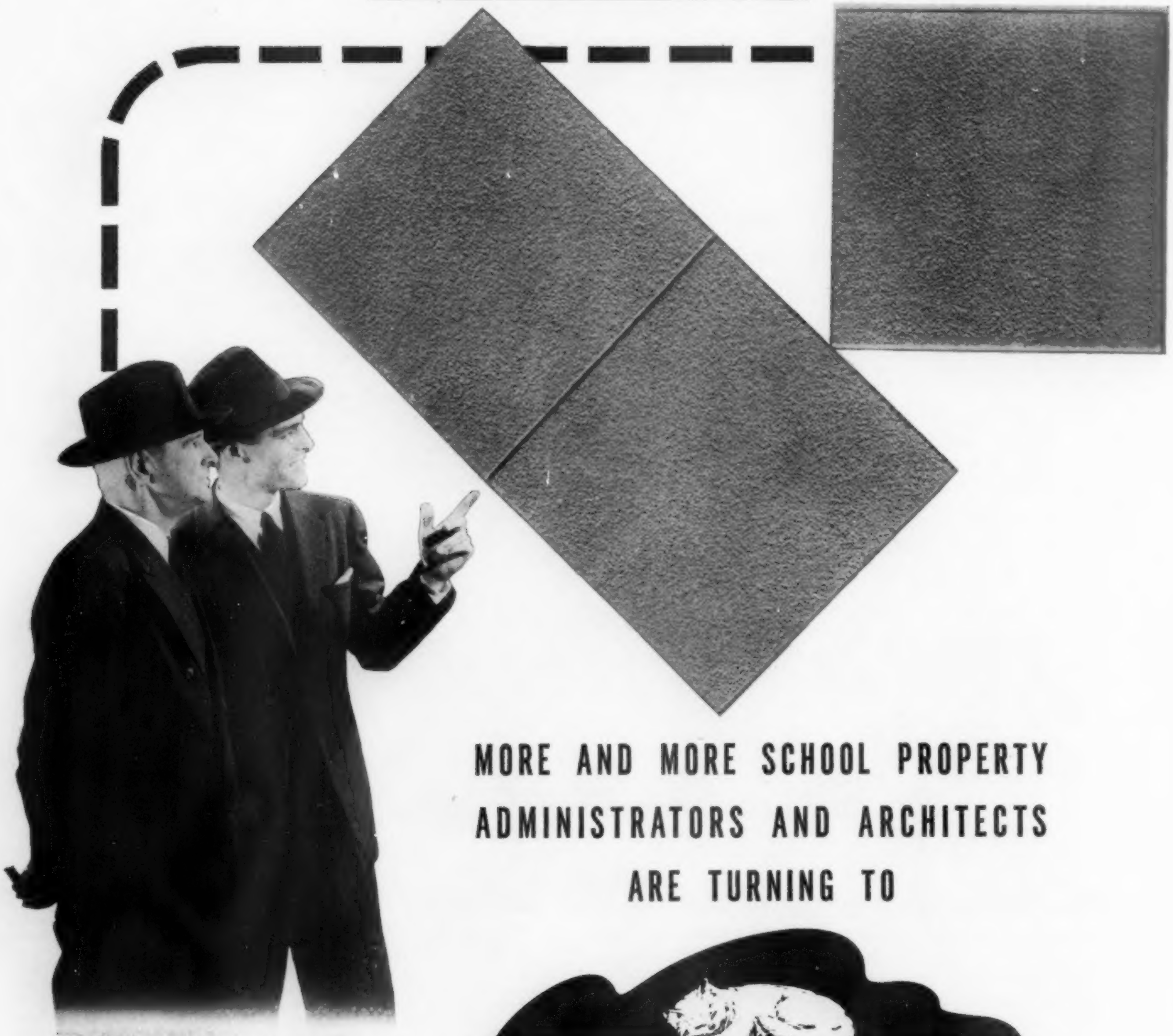


Structural Steel Stair constructed of channel stringers and steel plate risers, equipped with **Type 104 Wooster Abrasive Cast Full Width Tread**, cross-hatch surface, 1" Nosing.

WRITE FOR COMPLETE CATALOG OF WOOSTER PRODUCTS

AMERICAN ACOUSTICS, INC.

120 So. La Salle St., Chicago 3, Ill.



MORE AND MORE SCHOOL PROPERTY ADMINISTRATORS AND ARCHITECTS ARE TURNING TO

SOFTONE

NON-COMBUSTIBLE ACOUSTICAL TILE AND PLASTER

Here are some of the Schools, Colleges and Universities that have installed SOFTONE

Long Island College of Medicine, N. Y. C.
Tilden High School, N. Y. C.
Hunter College, Auditorium, N. Y. C.
University of Maryland, College Park, Md.
St. Mary's College, South Bend, Ind.
University of Michigan, Administration Bldg.
University of Michigan, Engineering Bldg.
Community School Buildings, Dover, Del.
Frederick High School, Frederick, Md.
High School Music Rooms, Greensboro, N. C.
High School, Grosse Point, Mich.
Haverford High School, Ardmore, Pa.
Andrew's School, Houston, Texas
Imperial School, Houston, Texas
Buena Vista School, Houston, Texas
Yeshiva College, N. Y. C.
City College, Army Hall, N. Y. C.
Polk State School, Polk County, Pa.
High School Auditorium, Rochester, Ind.

THESE OUTSTANDING FEATURES MAKE THESE MATERIALS IDEAL FOR

CLASSROOMS	OFFICES
CORRIDORS	CAFETERIAS
SWIMMING POOLS	AUDITORIUMS

SOFTONE NON-COMBUSTIBLE ACOUSTICAL TILE

ACOUSTICAL EFFICIENCY: SOFTONE possesses a high coefficient of noise reduction ranging from .65 to .80.

APPEARANCE: SOFTONE'S fine grain surface gives ceilings and walls a luxuriant finish.

INCOMBUSTIBILITY: SOFTONE is incombustible, has successfully withstood a flame test of 2800° F. for one hour.

LIGHT REFLECTION: The factory-painted "Sunny White Finish" has a light reflectivity, averaging 85%.

LOW MAINTENANCE: SOFTONE is a "non-breathing" material that stays cleaner longer because dust and dirt are stopped on the surface. Can be readily washed or cleaned with any standard wall paper cleaner.

PAINTING: SOFTONE may be repainted without noticeably affecting the acoustical efficiency. Spray painting is preferable, but either method may be used.

MOISTURE RESISTANT: SOFTONE will not shrink, warp, bulge or swell.

SANITARY: SOFTONE will not harbor vermin or permit fungus growth.

MODERATE COST: SOFTONE tiles may be cemented by adhesive directly on a solid backing. They may be nailed to wood furring strips or installed by any standard metal suspension system. Fibre splines on all sides prevent breathing at the joints and assures a true level, ceiling surface. This variety of application permits a cost range to suit the budget. Lower construction costs are possible by using the famous FAMCO metal suspension.

SOFTONE NON-COMBUSTIBLE PLASTER

Made of the same ingredients as the tile, it embodies the same desirable characteristics. This plaster works easily and can be applied to any clean surface, such as brick, rock lath, metal lath, concrete, cement blocks, etc. A one inch thickness of SOFTONE can be applied to walls and ceilings in two coats. Without further operations it is spray or brush painted, producing a fine looking, acoustically efficient monolith surface.

FAMCO METAL SUSPENSION

This superior method for erecting ceiling tile offers advantages in old as well as new structures. It can be installed directly over sheet metal ceilings without its removal. Because of its greater flexibility and fewer parts — ceilings are easily and more quickly installed in perfect alignment.

CONSULT SWEET'S CATALOG FOR SPECIFICATIONS, SCIENTIFIC REPORTS, TYPES AVAILABLE AND INSTALLATION DETAILS, OR WRITE US FOR A COPY OF THIS INFORMATION.

Public School, Beaumont, Texas
Blackstone College, Blackstone, Va.
Pratt Museum, Boston, Mass.
Holy Cross Academy, South Bend, Ind.
Teaneck Grade School, Teaneck, N. J.
Preparatory College, Clark's Summit, Pa.
Concord Academy, Concord, Mass.
Marycrest College, Davenport, Iowa
Mooney Junior High School, Denver, Col.
Christopher High School, Chicago, Ill.
University of Wisconsin, Atomic Laboratory
DeKalb High School Swimming Pool, DeKalb, Ill.

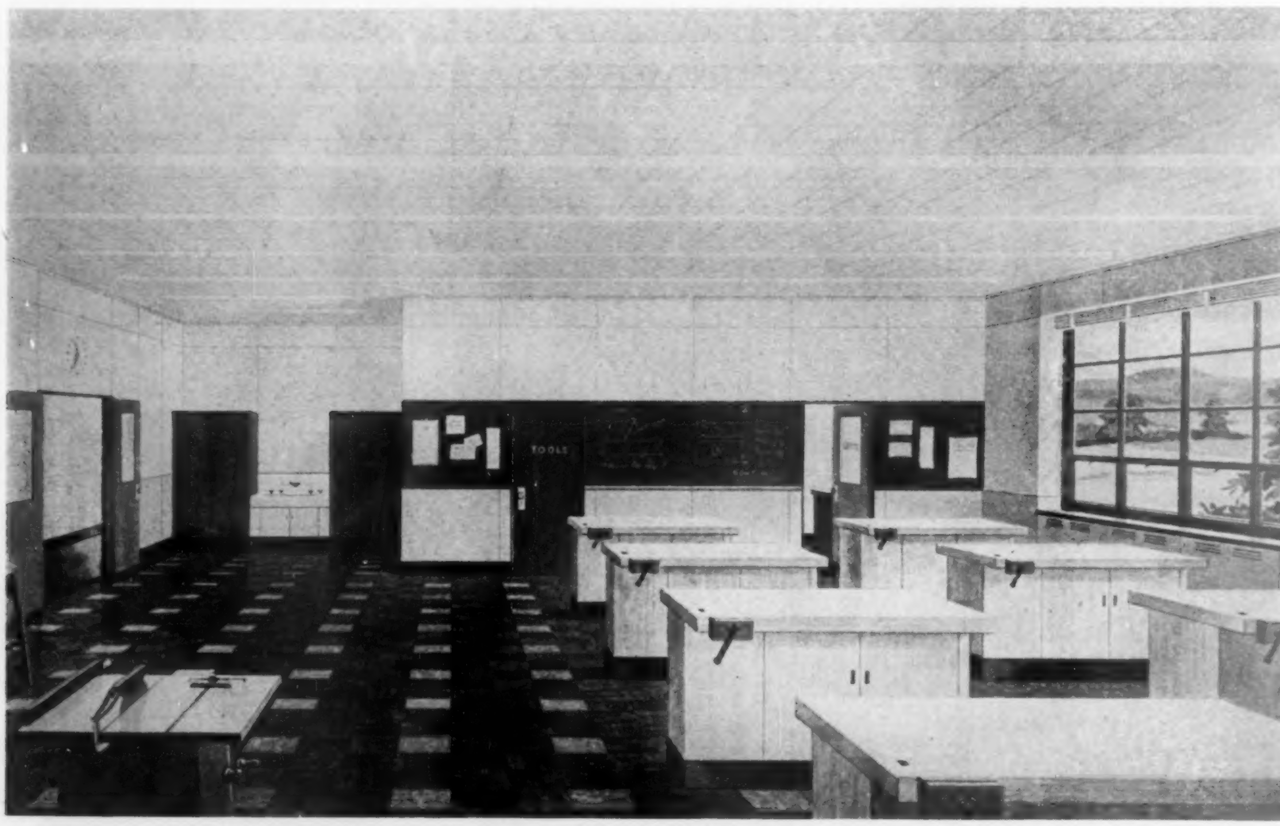
Architects and others interested in acoustical correction or noise reduction are invited to make use of our Acoustical Engineering Service. Unusual or difficult jobs will be reviewed, and recommendations made "Gratis." Address all such inquiries to the New York Office giving, in each case, the name of the job and all information necessary for proper analysis of the problem.

AMERICAN ACOUSTICS, INC.
74 TRINITY PLACE • NEW YORK 6, N. Y.

JOHNS-MANVILLE

22 East 40th St., New York 16, N. Y. OFFICES IN ALL LARGE CITIES

UNIT CONSTRUCTION FOR SCHOOLS



Typical schoolroom built in accordance with the principles of Johns-Manville Unit Construction. Walls are movable Asbestos Transite.* Ceilings are J-M Acoustical Units with fluorescent lighting. Floors are colorful J-M Asphalt Tile

THE COMPLETE INTERIOR — WALLS, CEILINGS, FLOORS

The educational needs of any community are ever changing and unpredictable. Often it may become desirable to expand or subdivide schoolroom units or to convert a school from one type to another, as from grade school to junior high, or from academic to vocational. Johns-Manville Unit Construction provides a practical, proved and economic method to give school buildings this needed flexibility.

Three Johns-Manville building materials—Transite Walls—Acoustical Ceilings—Asphalt Tile Floors—are united in Unit Construction. All are under one specification and one manufacturer's responsibility.

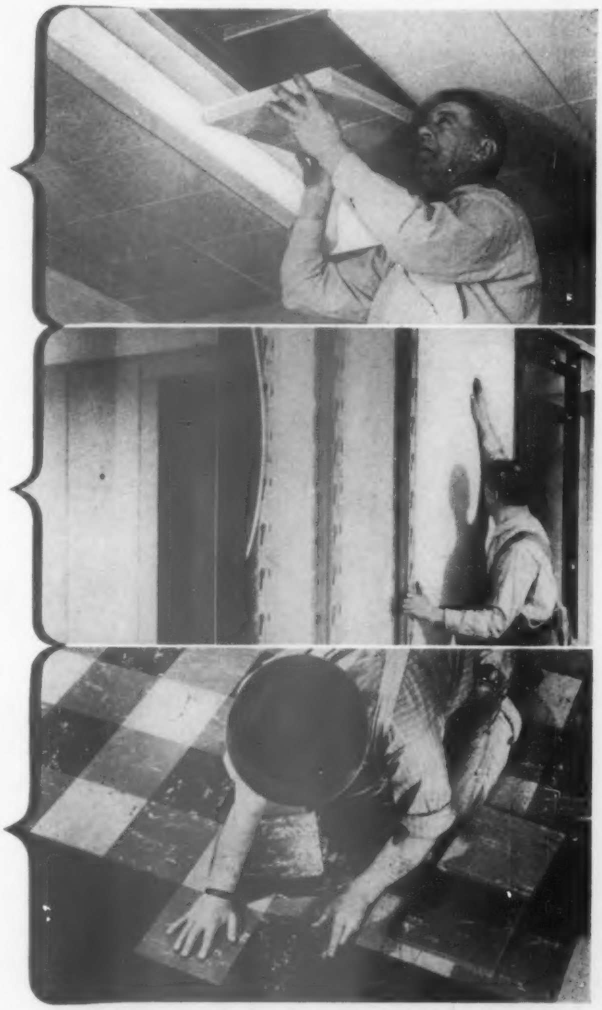
Of course, the three building materials in the System can be used independently, or any two of them can be combined for a particular service. Johns-Manville Acoustical Ceilings, Asphalt Tile Floors and Transite Movable Walls, the individual materials used in Unit Construction, are illustrated on the following page.

Representatives in Johns-Manville offices, situated in all large cities in this country and Canada, will appreciate the opportunity to consult further with you about Unit Construction or about any of the three building materials which are combined to form this System of construction.

* Reg. U. S. Pat. Off.

JOHNS-MANVILLE ACOUSTICAL CEILINGS

Acoustical Ceilings, an important factor in helping to overcome the handicap of distracting noise, are beneficial both to teacher and student alike. They give the desired degree of quiet for effective teaching, eliminate frequent causes of nervousness, and are proved aids to concentration. An exclusive J-M patented construction system permits interchangeability of flush-type fluorescent lighting and acoustical ceiling units. J-M Acoustical Ceilings are easily maintained.



JOHNS-MANVILLE TRANSITE MOVABLE WALLS

Transite Movable Walls are the keystone of flexibility in Unit Construction. They can be disassembled and relocated as educational needs require. With the least inconvenience you can enlarge or decrease areas almost overnight. Made of fireproof asbestos and cement, two practically indestructible materials, these movable panels are used not only to form the rigid, double-faced partitions 4" in thickness, but also to finish the interior of the outside walls as well.

JOHNS-MANVILLE ASPHALT TILE FLOORS

Asphalt Tile Flooring completes the Unit Construction System. Made of asbestos and asphalt, the units withstand the kind of hard wear and abuse expected in any school building. Asphalt Tile Floors are durable, pleasantly comfortable, are quiet underfoot, reducing the disturbing effects of noisy footsteps in classrooms, corridors, gymnasiums, etc. Made in a wide variety of plain and marbleized colors, Asphalt Tile Floor individual units permit easy alterations or extensions.

J-M FLEXSTONE BUILT-UP ROOFS

As pioneers in the roofing field and manufacturers of a complete line of built-up roofing products, Johns-Manville recommends the Flexstone Asbestos Built-Up Roof as the most satisfactory for school service from the double standpoint of economy and fire-protection.

The asbestos felt as used in the J-M Flexstone Roof does not support combustion and therefore provides a marked superiority in fire-resistance over the ordinary roofing felt.

Furthermore, since asbestos has the durability of stone, long exposure to sun, rain and weather have little effect on these roofs. Rot-proof, they need no periodic coating. Because Flexstone Roofs are smooth-surfaced, there is no excess weight of slag or gravel. Maintenance costs are low. Many Johns-Manville Flexstone Asbestos Roofs that were applied 25 and 30 years ago are still giving service with little or no upkeep, testifying to the outstanding economy of this type of built-up roof.

Further details and specifications furnished on request.

Bonded for 10 years—still going strong after 25 years of service! That's the record of the J-M Asbestos Built-Up Roof on the Poly Prep Country Day School, Brooklyn, N. Y. It is typical of the service provided by these better built-up roofs

THE CELOTEX CORPORATION

Chicago 3, Illinois

"SAFE TREAD"
...for safe walkway surfaces

The Safe Tread Company, Inc., is headed by a past President of the American Society of Safety Engineers, who pioneered in the design and production of abrasive metal products for structural purposes, and who, for over 25 years, has been one of the leading figures in the nation-wide effort to overcome the serious hazards of unsafe walkways.

Associated with him are competent engineers, manufacturers, and sales representatives, specially trained in this particular field.

Architects, engineers and others, in their efforts to overcome the vicious slipping hazards that are one of the most common and costly sources of personal injury, have been greatly handicapped by the hitherto limited variety of suitable and dependable SAFE walkway materials.

"SAFE TREAD" products have been developed to provide not only dependable, enduring underfoot safety, but also an adequate range of forms and materials for selection and adaptation to almost any condition of service and architectural scheme.

The facilities of two foundries, a leading abrasive grain, and a ceramic tile manufacturer, are utilized in the production of "Safe Tread" products, under exclusive material, design and process patents and licenses.

With a background of such sound experience, practical knowledge, and manufacturing facilities, "Safe Tread" products may be specified with full confidence that they will provide the best available enduring anti-slip walkway surface.

Consultations on walkway safety problems and tentative estimates on preliminary surveys may be obtained without obligation.

THE SAFE TREAD CO., Inc.
30 Vesey Street
New York 7, N. Y.

"SAFE TREAD" ABRASIVE METALS

The "Safe Tread" Process

"Safe Tread" Abrasive Metal is made by a *patented process* which produces anti-slip treads having a diamond-hard abrasive:

(1) Deeply embedded in and firmly held by the metal *without an intervening film of foreign material* to weaken the grip of the metal on the abrasive. (When the abrasive grains are sprayed or coated with a foreign substance to prevent washing or floating as the molten metal enters the mold, the metal cannot make intimate contact with them—a condition that clearly affects the durability of the tread.)

(2) Projecting slightly to give a safe footing under all conditions. (Unless the grains project slightly above the metal to give the necessary "bite" the surface is no more anti-slip than metal without any abrasive); and

(3) Closely distributed in the surface so that the metal is protected from wear.

Scope of Use

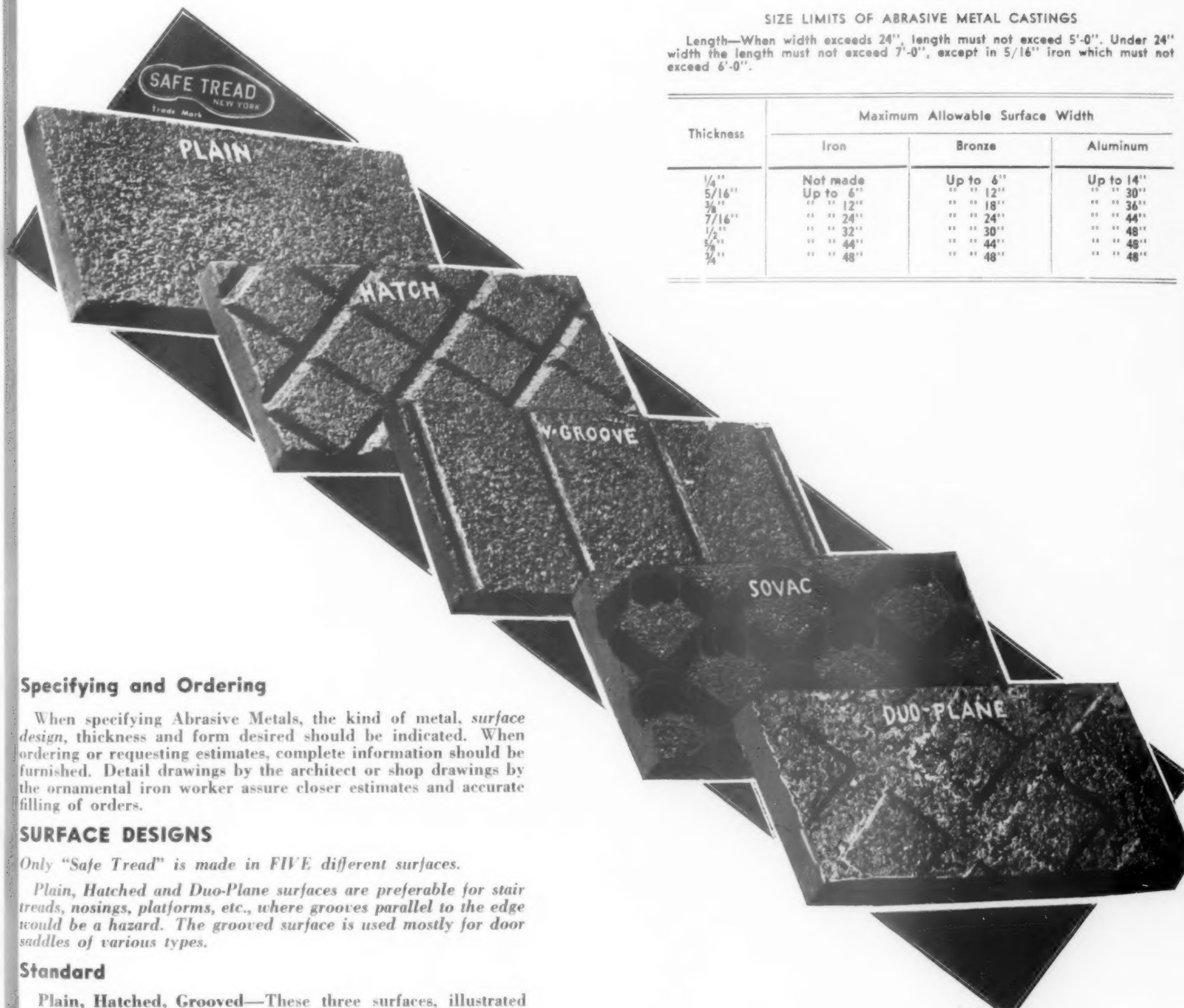
"Safe Tread" Abrasive Metals are suitable for *inside* or *outside*—wherever slipping is to be prevented or excessive wear withstood, in either new or repair work. It has met the most exacting requirements and has been furnished for over 6,000 outstanding projects during the past ten years; by direct purchase under the rigid inspection of the U. S. Navy; on contracts for public buildings, including postoffices, hospitals, schools, etc., and for private work including office buildings, stores, churches, dairies, packing houses, factories, railroads, subways, etc.

"SAFE TREAD" ABRASIVE METALS (continued)

SIZE LIMITS OF ABRASIVE METAL CASTINGS

Length—When width exceeds 24", length must not exceed 5'-0". Under 24" width the length must not exceed 7'-0", except in 5/16" iron which must not exceed 6'-0".

Thickness	Maximum Allowable Surface Width		
	Iron	Bronze	Aluminum
¼"	Not made	Up to 6"	Up to 14"
5/16"	Up to 6"	" " 12"	" " 30"
⅜"	" " 12"	" " 18"	" " 36"
7/16"	" " 24"	" " 24"	" " 44"
½"	" " 32"	" " 30"	" " 48"
⅝"	" " 44"	" " 44"	" " 48"
¾"	" " 48"	" " 48"	" " 48"



Surface Designs

Specifying and Ordering

When specifying Abrasive Metals, the kind of metal, *surface design*, thickness and form desired should be indicated. When ordering or requesting estimates, complete information should be furnished. Detail drawings by the architect or shop drawings by the ornamental iron worker assure closer estimates and accurate filling of orders.

SURFACE DESIGNS

Only "Safe Tread" is made in FIVE different surfaces.

Plain, Hatched and Duo-Plane surfaces are preferable for stair treads, nosings, platforms, etc., where grooves parallel to the edge would be a hazard. The grooved surface is used mostly for door saddles of various types.

Standard

Plain, Hatched, Grooved—These three surfaces, illustrated above, are common to all makes of abrasive metal and are furnished in various forms in cast iron, bronze, nickel and aluminum.

Special

To meet the demand for still more durable anti-slip quality, and to provide certain characteristics not obtainable in the common or Standard Surfaces of the "Safe Tread" and other makes of abrasive metals, two special surfaces known as "*Duo-Plane*" and "*Sovac*" have been developed. After service tests of several years under severest conditions they are recommended as the best available materials for their respective purposes.

"Duo-Plane"

The "Duo-Plane" Safe Tread embodies a new principle by providing an upper or initial contact plane composed of the tops of squares (b.b.) about $\frac{3}{4}$ x $\frac{3}{4}$ in. separated by rectangular section valley about $\frac{1}{16}$ in. deep and 13/32 in. wide. Abrasive grains (d.d. and e.e.) are embedded at the time of casting, in *both* the squares and bottoms of the valleys to a depth of about $\frac{3}{32}$ in. in each. When elevations are worn down, contact begins on anti-slip surfaces at bottoms of the valleys, thus providing *double life. (In Standard Surfaces there is only one wearing plane thickness of abrasive.)* This type is especially desirable for maximum durability and effectiveness.

Cross Section of "Duo-Plane Safe Tread"

"Sovac"

The superiority of Abrasive-Metal for non-slip purposes and resistance to wear under heavy traffic, is familiar to most engineers. These advantages are now given added effectiveness by the "Sovac" surface for use in those industries where heavy slime, grease and dirt create a difficult slipping hazard.

"Sovac" is a surface of great durability and effectiveness, that will not "clog-up" under grease, oil, mud, dust, etc. "Sovac" Safe Tread was developed through the combined efforts of *safety engineers* in the oil industry and THE SAFE TREAD COMPANY, INC.

Features are:

(1) Diamond-hard abrasive surface is actually non-slip and extremely resistant to wear.

(2) Deep, wide, cross-hatched grooves take dirt and muck that would otherwise clog up walking surface.

(3) Diagonal grooves, facilitate cleaning.

(4) Large holes at groove intersection make treads actually self-cleaning when supported on angle irons or grating; or as a self-supporting "structural" tread.

(5) Made only of cast iron with aluminum oxide abrasive grains embedded in wearing surface, it is not susceptible to corrosive action of weather, acid fumes, or oil.

"SOVAC" STANDARD SIZES

Length	Width		Length	Width	
	Flat Tread	Ladder Tread		Flat Tread	Ladder Tread
36"	3", 4½", 6", 7½"	4½", 6", 7½"	24"	6", 7½"	6", 7½"
48"	3", 4½", 6", 7½"	4½", 6", 7½"	30"	12"	

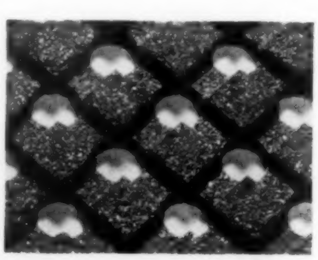
NOTE: Patterns or stock of above sizes insure prompt delivery. Customer standards developed for special use will include additional pattern charge and longer time for delivery.

"Sovac" Ladder Type

A complete one-piece tread, self supporting, for use where ladder type construction with SAFETY is desired for access to tanks, machinery, grease pits, ships ladders, engine steps, etc.

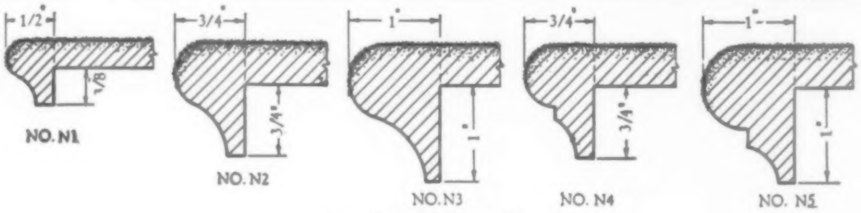
"Sovac" Flat Type

For use in or on floors and steps around service pits, refineries, storage tanks, saponification vats, canning factories, piers, ships, etc. Made in standard sizes. May be used as units or laid together to cover large areas.

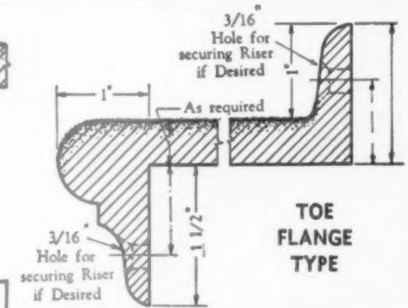


TYPICAL DETAILS OF "SAFE TREAD" FORMS

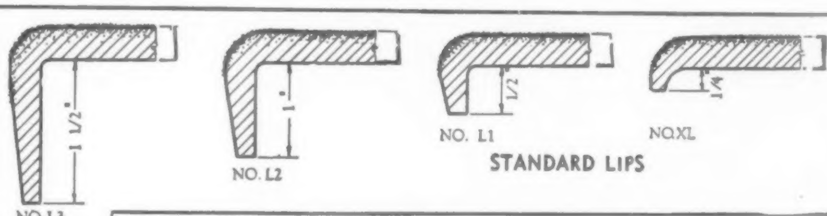
The following details are suggestive of the many forms in which "Safe Tread" Abrasive Metals are available. They can be cast in practically any form to meet specific requirements. Minimum thickness: $\frac{3}{16}$ in. for Iron; ¼ in. for Bronze and Aluminum.



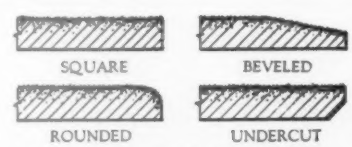
STANDARD NOSINGS
Other types are available



TOE FLANGE TYPE

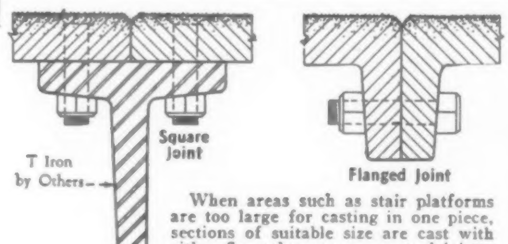


STANDARD LIPS

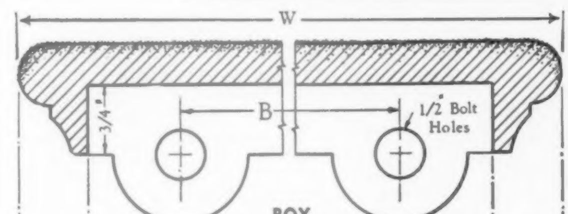


STANDARD ENDS AND EDGES
Used with any type nosing or lip

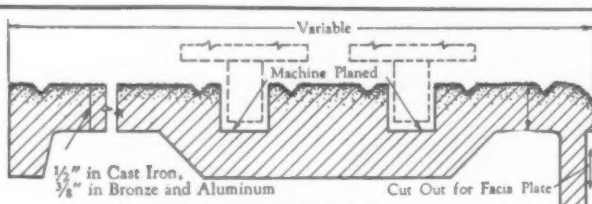
SECTION JOINTS



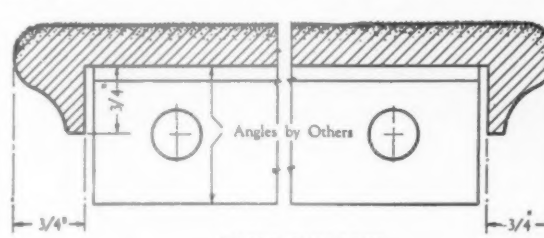
When areas such as stair platforms are too large for casting in one piece, sections of suitable size are cast with either flanged or square ground joints, as specified



BOX FLANGE TYPE

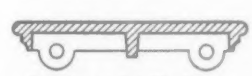


TYPICAL ELEVATOR SADDLE



ANGLE SUPPORTS

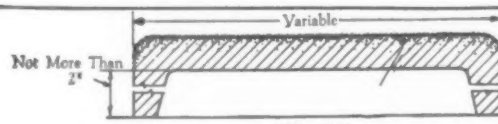
The usual supports for ends of structural stair treads are angles fabricated with the iron work. When desired, treads with end lugs or box flanges are cast as part of tread, in which case holes for ½" bolts are cored on standard spacing shown below:



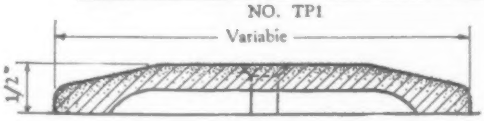
Reinforcing Rib Used When Necessary With Structural Treads

STANDARD SPACING (INCHES)

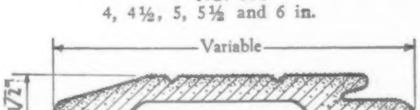
W	5	6	7	8	9	10
B	2	3	3½	4	5	6



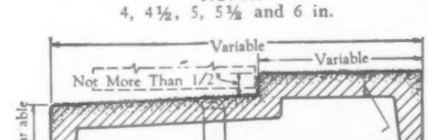
NO. TP1



NO. TP2
4, 4½, 5, 5½ and 6 in.



NO. X1
4, 4½, 5, 5½ and 6 in.



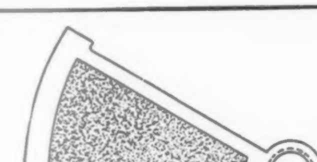
NO. TP3

STYLE NO. TP1 AND TP2 MADE WITH OR WITHOUT CUTOUT FOR RIXSON HINGE.

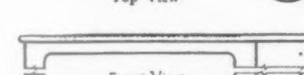
THRESHOLDS AND SADDLES

The abrasive top surface of "Safe Tread" spirals and landings makes possible the safe use of an otherwise dangerous type of stair. Made in standard sizes only, with collars for 3½" pipe; 12 to 16 per circle, 18", 21" and 24" to 36" radius (in increments of 1"), with circular or square landings

Side View



Top View



Front View

SPIRAL TREADS AND LANDINGS

Application

The necessity of providing slip-proof stairs and walkways for the safety of children and teachers in schools has been established by the courts. Higher liability insurance rates due to accidents, especially falls on stairs, are avoided by the use of approved safety treads.

Maintenance costs are eliminated when "SAFE TREAD" abrasive metal treads are installed.

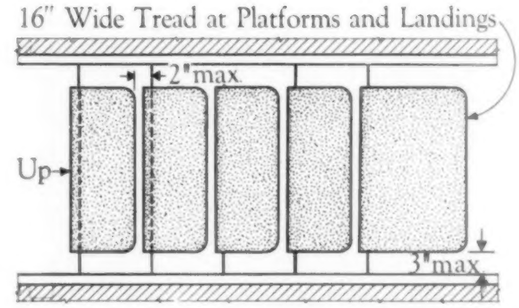
IN NEW CONSTRUCTION

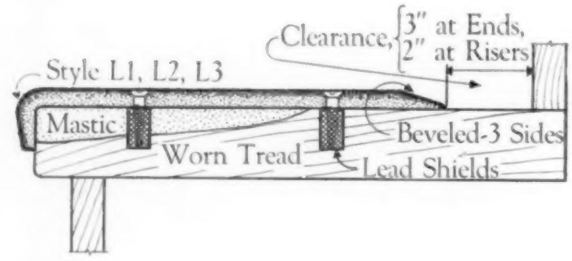
Iron, bronze or aluminum 'SAFE TREAD" door saddles, stair treads, floor plates, etc. are in all required forms, many of which are shown in sectional detail on page 5.

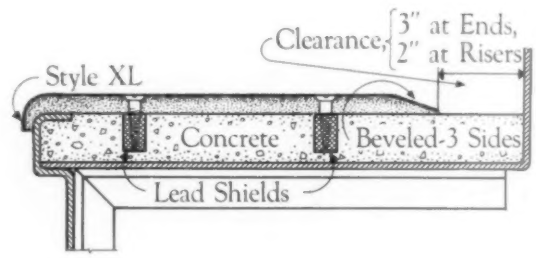
Special forms to meet unusual conditions are designed and furnished as required.

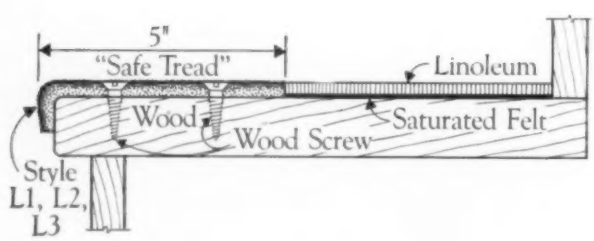
FOR REPAIRS TO WORN STAIRS

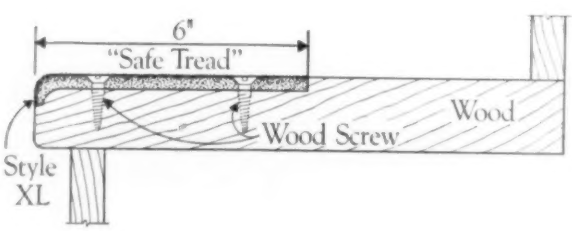
Existing stair treads, worn or slippery, are readily and economically repaired and made safe with "SAFE TREAD". Approved methods are shown in detail.











SUBMIT YOUR STAIR PROBLEMS TO US. WE ARE

HAPPY TO BE HELPFUL.

OTHER "SAFE TREAD" WALKAWAY PRODUCTS.

"Safe Tread" Terrazzo and Cement Floor Finish Aggregates

For use in Terrazzo, pre-cast stone, and other composition floors where fast colors are desired and a non-porous and anti-slip element is essential for Safety and Sanitation.

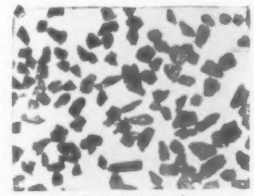
Being approximately spherical or cube-shaped, they provide maximum surface for cement adherance. They are anti-slip, *non-porous and fast colored*, stronger, harder and more durable than any crushed natural or manufactured semi-vitreous aggregate.

These aggregates are crystalline aluminum oxide, produced by electrical fusion, crushed and screened to desired size, excelled in hardness only by the diamond.

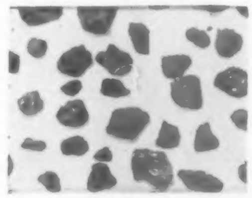
They are troweled or floated into cement finish floors to provide an effective and more durable anti-slip walking surface. Sizes 6-12, 12-20, 16.

Use ½ lb. per sq. ft.

Colors—Dark Brown to Black.



12-30 Mesh



6-12 Mesh

Full size of two abrasive aggregates

Troweling "Safe Tread" Abrasive Aggregates into New Cement Floor

Anti-Slip Filler Strips

"Safe Tread" Abrasive Filler Strips provide protection against slipping and wear in places where other forms are not so well adapted for architectural and other considerations.

They are applied in grooves cut in marble, terrazzo on other stone treads, either new or old. Furnished only in strips ½" x ½" x 18".

"Safe Tread" Abrasive Filler Strips Applied to Terrazzo Treads

Anti-Slip Ceramic Tile

"Safe Tread" Abrasive Tile are vitrified ceramics with 15% abrasive content, *non-porous*, fast colored, and effectively anti-slip.

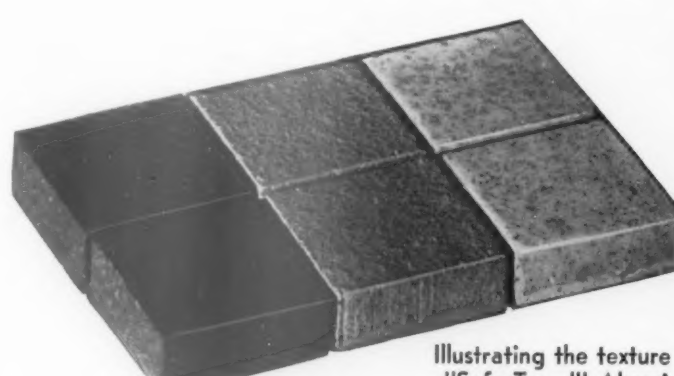
Because of their decorative, as well as anti-slip qualities, "Safe Tread" Abrasive Tile are especially adaptable for use on the walkways of public and private indoor swimming pools, and hotel and institutional kitchen floors; also used extensively for store entrance floors, vestibule floors in office buildings, hotels, apartment houses, etc.

Colors—Red, Brown, Gray, and Tan.

Sizes and Types

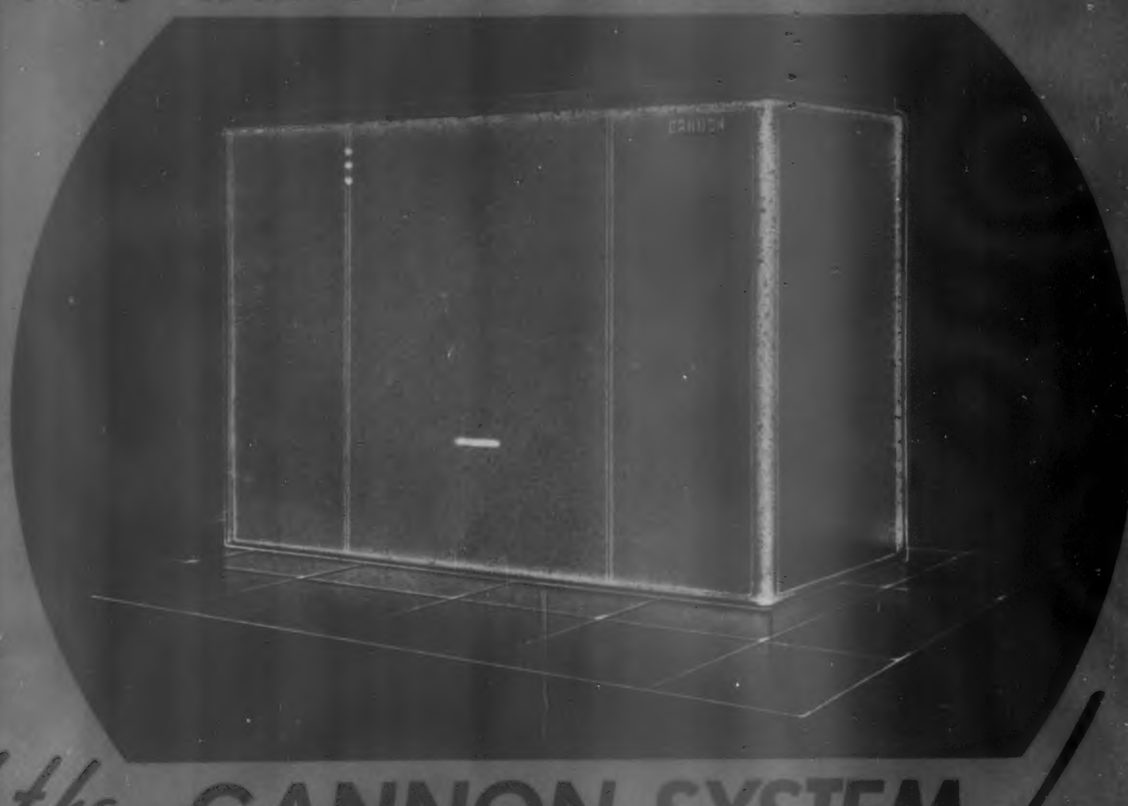
FLOOR TILE	STAIR TILE
6 x 3 x ½	6 x 4 x ½
6 x 6 x ½	6 x 4 x ¾
6 x 3 x ¾	6 x 6 x ½
6 x 6 x ¾	6 x 6 x ¾

Stair Tile have one long edge rounded to ¼" radius.

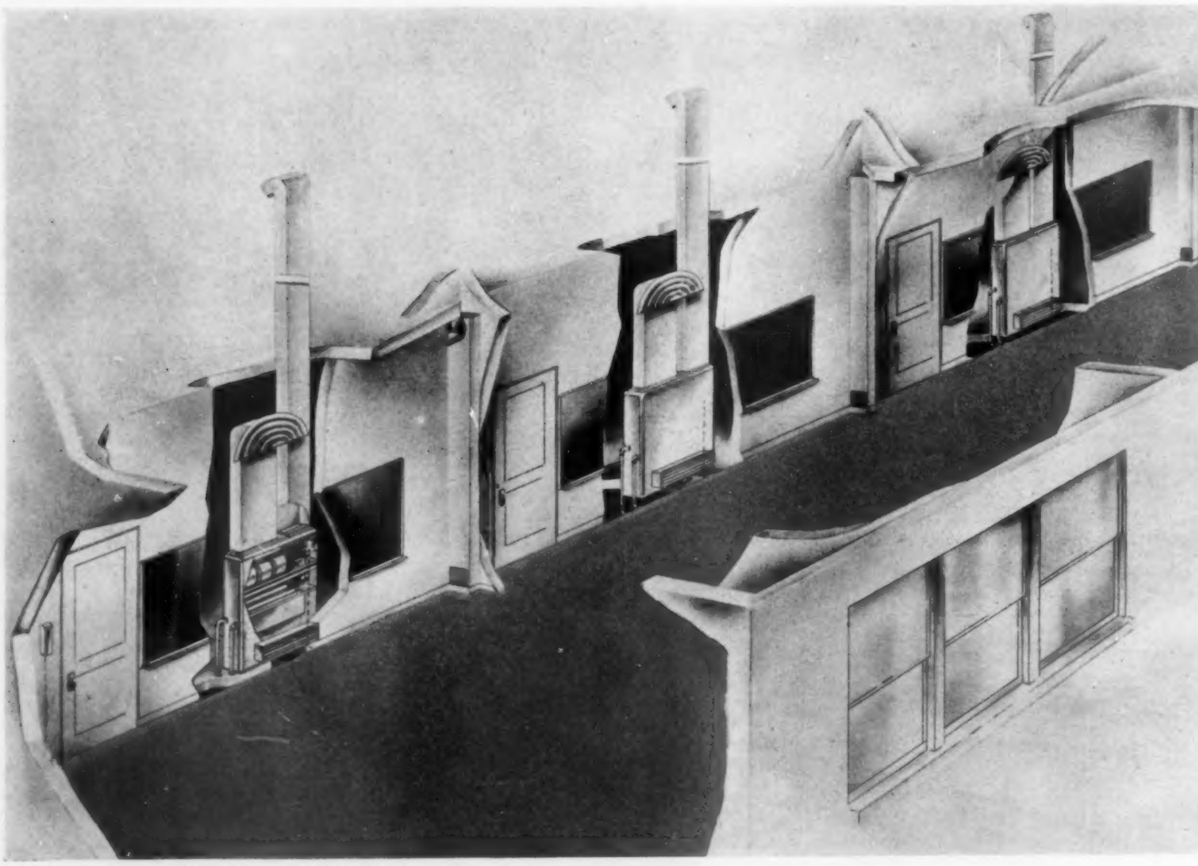


Illustrating the texture of "Safe Tread" Abrasive Floor Tile


SCHO



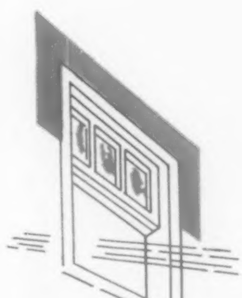
the GANNON



This cutaway illustration shows how Gannon system fits into a school building. Cold air return to outside wall is optional.

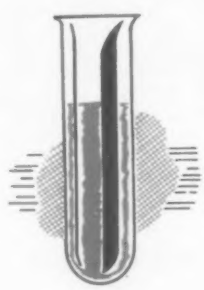
Quite often comfort means health. Gannon system provides comfort and further contributes to health by furnishing fresh undevitalized air without drafts. Kills airborne bacteria thereby minimizing the contagion of "school house diseases."

SYSTEM *means health and comfort in the classroom —*



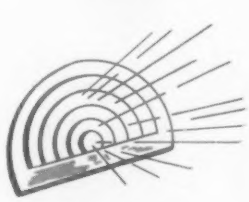
VENTILATES

Many people of intelligence believe that open window ventilation is the only satisfactory method to get all the benefits of fresh outdoor air. Gannon system provides all of these benefits without the well-known objection to open windows.



COMBATS AIRBORNE BACTERIA

"Prevention is by far better than cures" Gannon system actually kills airborne bacteria on the spot and thereby reduces to a minimum disease contagion and cross infection.



ECONOMY OF DIFFUSION

It is obvious that "something cannot be had for nothing." Economy by the Gannon system is accomplished by using heat that in ordinary systems is wasted. This heat is mixed and diffused by Anemostat draftless air diffusers.

HEATS

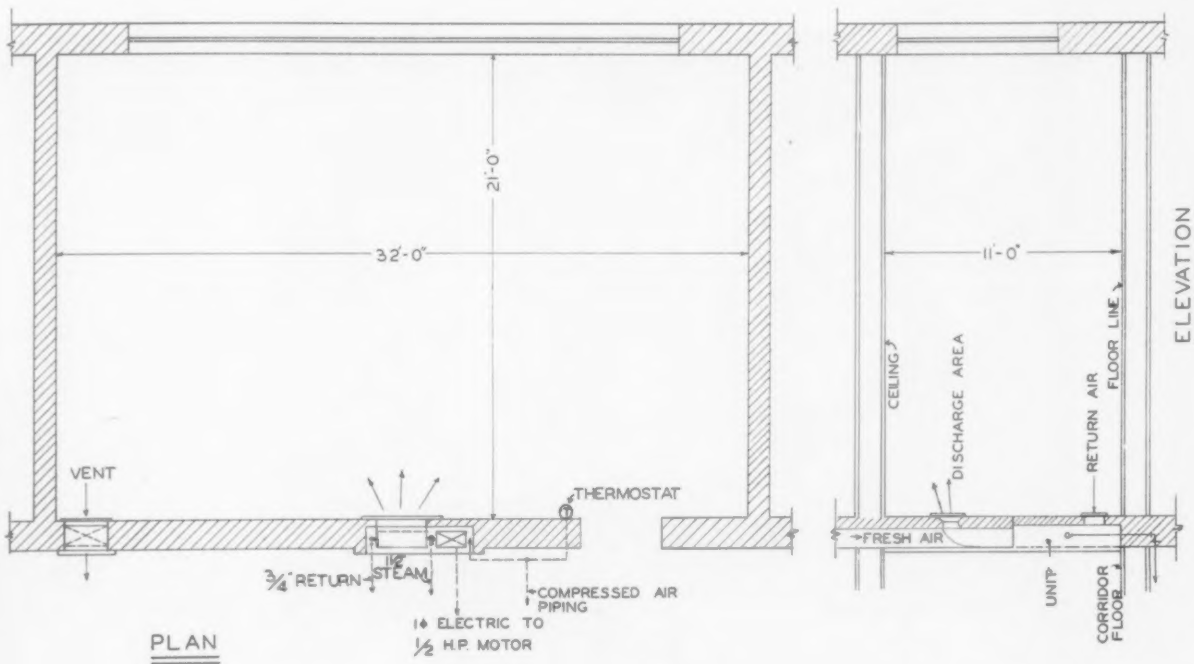
Heating is the basis on which all systems are founded. Gannon system provides plenty of heat regardless of climate—source of heat can be either steam or hot water.

DEODORIZES

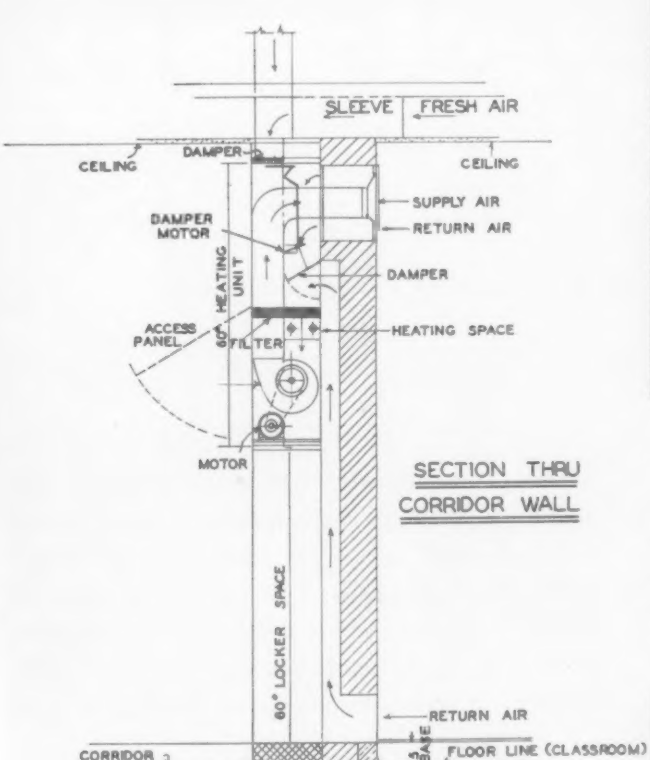
To date no satisfactory substitute for fresh air has been discovered. Most people recognize this fact but also realize that sometimes fresh air is expensive since it must be heated in winter and cooled in summer when delivered to occupied space indoors. Gannon system provides plenty of fresh air at a very minimum of heating or cooling cost.

This corridor is typical of grade school where no corridor lockers are used. Gannon units are installed where each offset is run in wall. Note convenience for Engineer or Janitor to service without interrupting school operations. Signal lights indicate at a glance the comfort condition of each classroom.

Typical classroom arrangement showing air supply and return inside the wall.

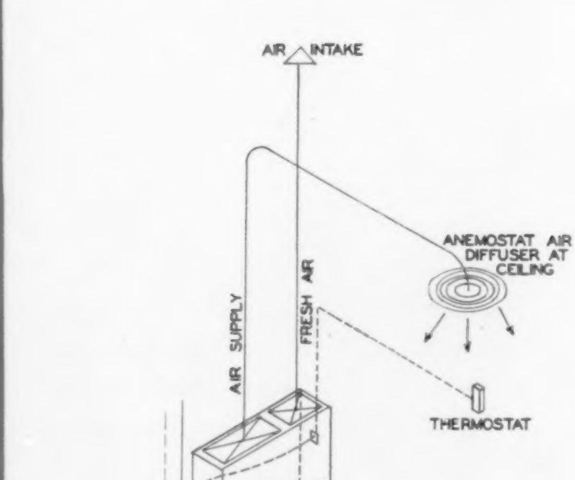


TYPICAL CLASSROOM INSTALLATION



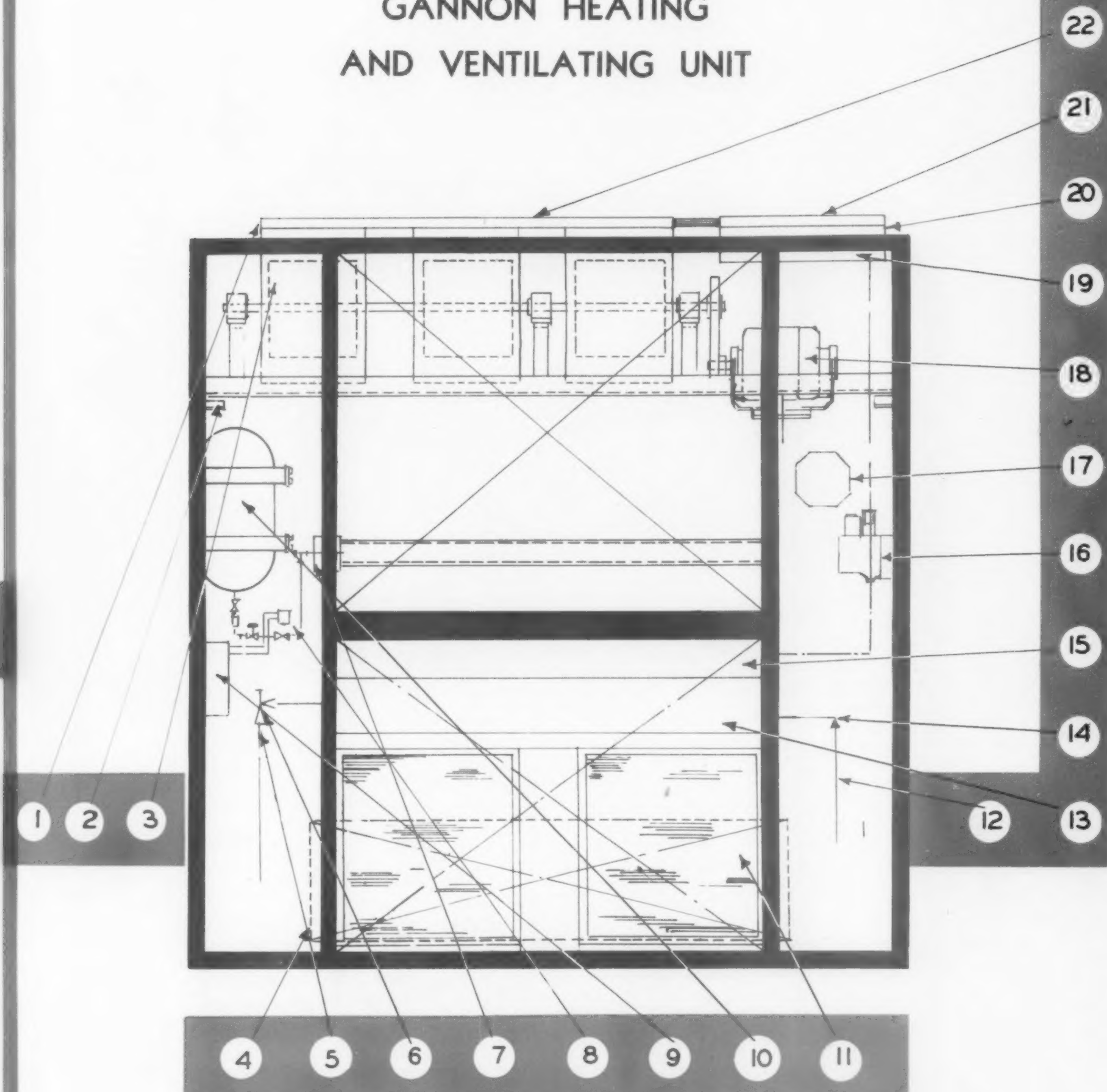
This arrangement shows how simple Gannon equipment is to install and also how easily it can be serviced without interfering with classroom routine. Note clear wall space in classroom which insures more usable floor space in each classroom.

"This unit is designed to be used where locker space is valuable. The unit can be installed above the lockers in the space which otherwise is not used. For further particulars communicate direct with Home Office."

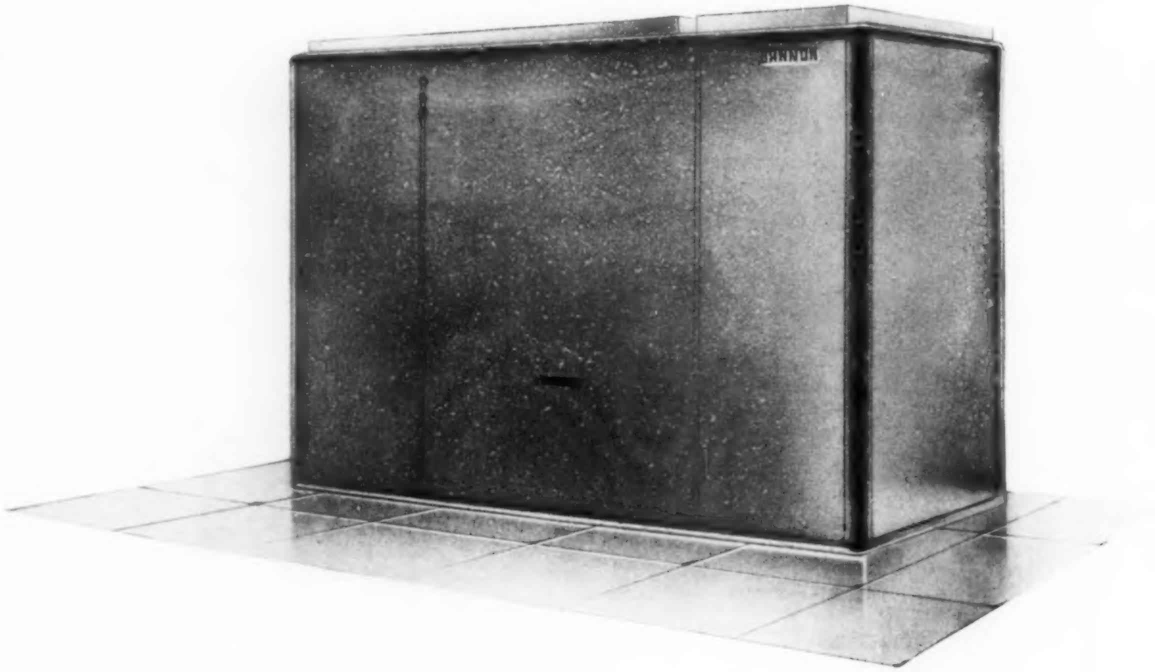


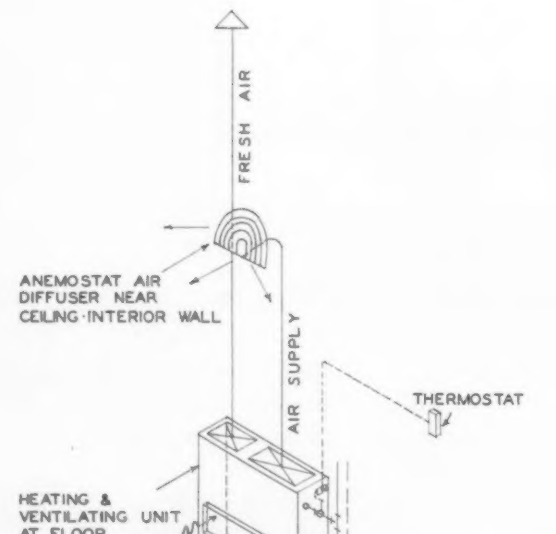
This is schematic arrangement showing air distribution through ceiling type draftless air diffusers and return air near floor on inside wall. Fresh air can be taken either direct from the roof or above the ceiling of the classroom and through an outside wall. Thermostatic control is located near unit on inside wall.

GANNON HEATING AND VENTILATING UNIT



1. Supply Outlet
2. Isolators
3. Blower Wheels
4. Return Air Opening
5. Supply Line
6. Control Valve
7. Heating Coil
8. Solenoid Valve to Control Flow of Tri-Ethylene Glycol
9. Timing Mechanism for Solenoid Valve
10. Tri-Ethylene Glycol Tank
11. Filters
12. Return Line
13. Coil (Steam or Hot Water)
14. "Thermo" Trap
15. Damper Assembly—Return Air
16. Damper Control Motor
17. Electric Connection Box
18. Motor
19. Damper—Fresh Air
20. Fresh Air Opening
21. Tempering
22. Thermo Generator

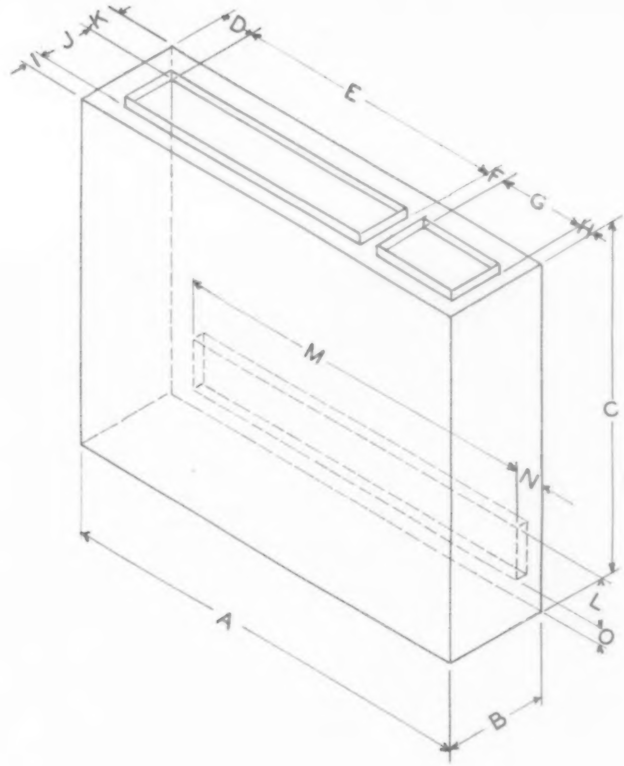




HEATING AND VENTILATING UNIT MODEL 2V

This unit has been designed for efficient and quiet operation. Every precaution is taken to eliminate as near as possible all mechanical and air noises.

Dimensions are not fixed since we recognize the necessity of building this type of equipment to fit existing conditions.

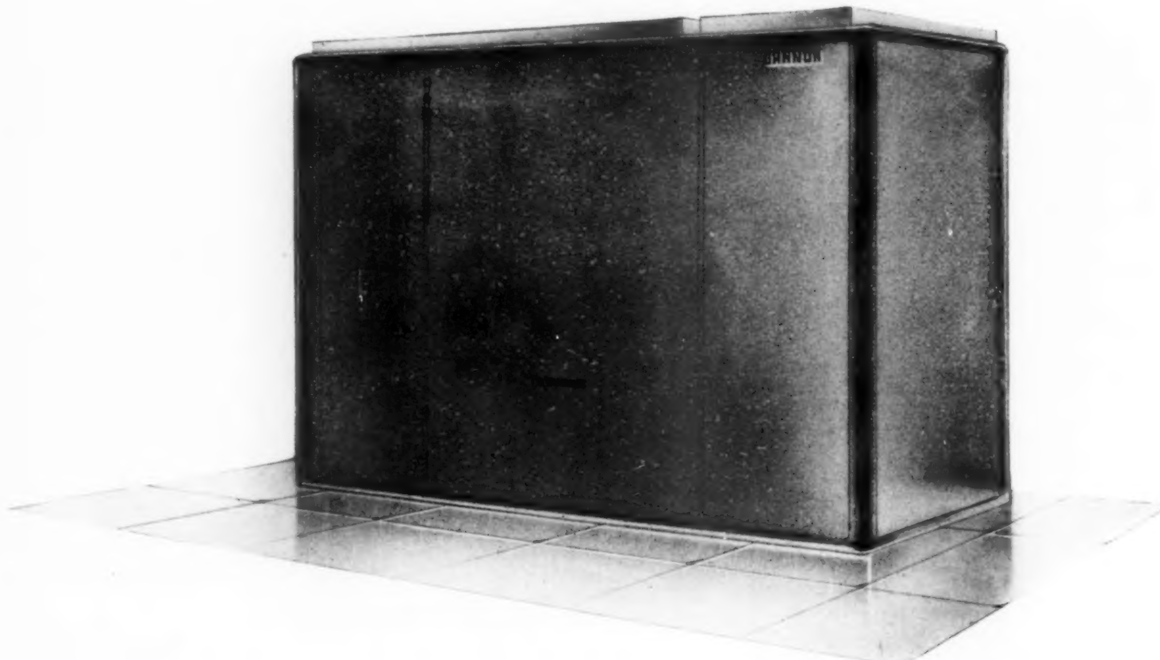


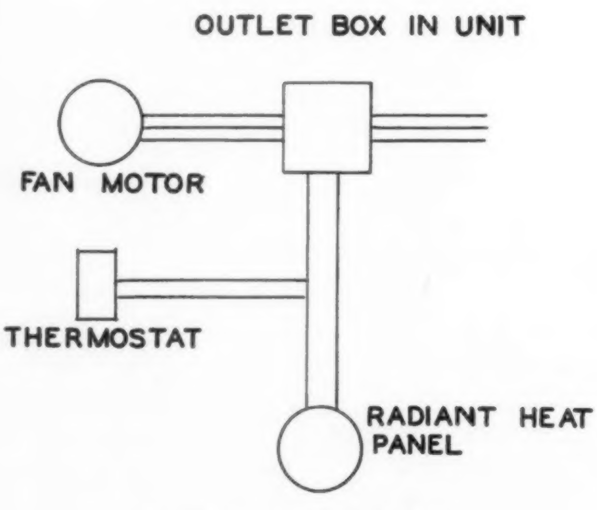
CAPACITY

MODEL 2V	C. F. M.	EXT. STATIC	H. P.	B.T.U. 2# STEAM 60 ENT. AIR
2-10-20	2,000	1/4	1/3	130,000
2-12-40	4,000	3/8	3/4	260,000
2-15-60	6,000	3/8	1	390,000
2-18-80	8,000	1/2	1 1/2	520,000
2-21-100	10,000	1/2	2	650,000

DIMENSIONS

MODEL 2V	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
2-10-20	65	20	60	7	40	1 1/2	15	1 1/2	1 1/2	11 1/2	6	12	36	5	1 1/2
2-12-40	74	24	66	7	44	1 1/2	20	1 1/2	2	15	7	16	40	16	1 1/2
2-15-60	83	30	70	2	53	2	24	2	3 1/2	24	2 1/2	16	48	17 1/2	2
2-18-80	94	32	72	8	58	2	24	2	11	19	2	24	72	10	2
2-21-100	111	38	74	10	67	2	30	2	2	34	2	24	72	16	2



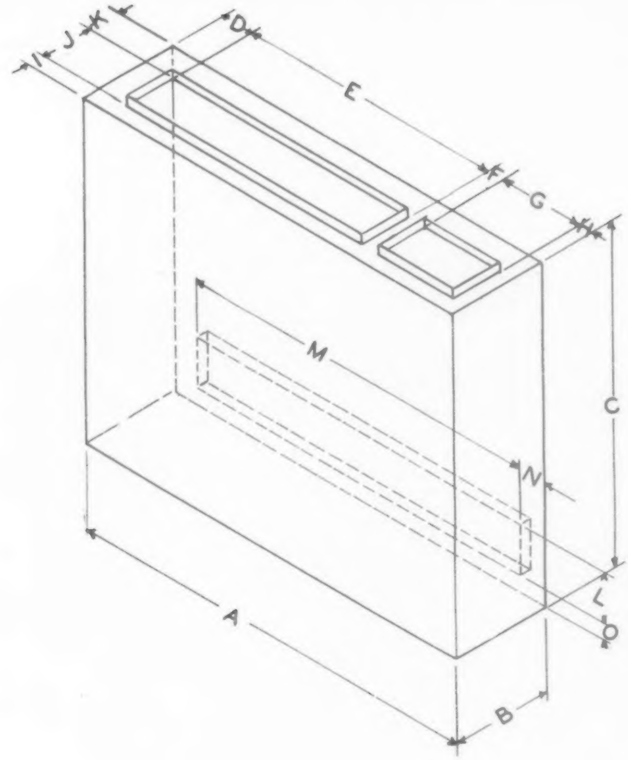


WIRING DIAGRAM

RADIANT HEATING AND VENTILATING UNIT MODEL 3V

Wherever it is desirable to warm floors such as locker rooms, kindergarten classrooms, etc., by radiant heat and at the same time to heat and ventilate another area, the Model 3V is the ideal unit.

Separate control is furnished for radiant heated area and also area served by forced air. Write home office for complete details.

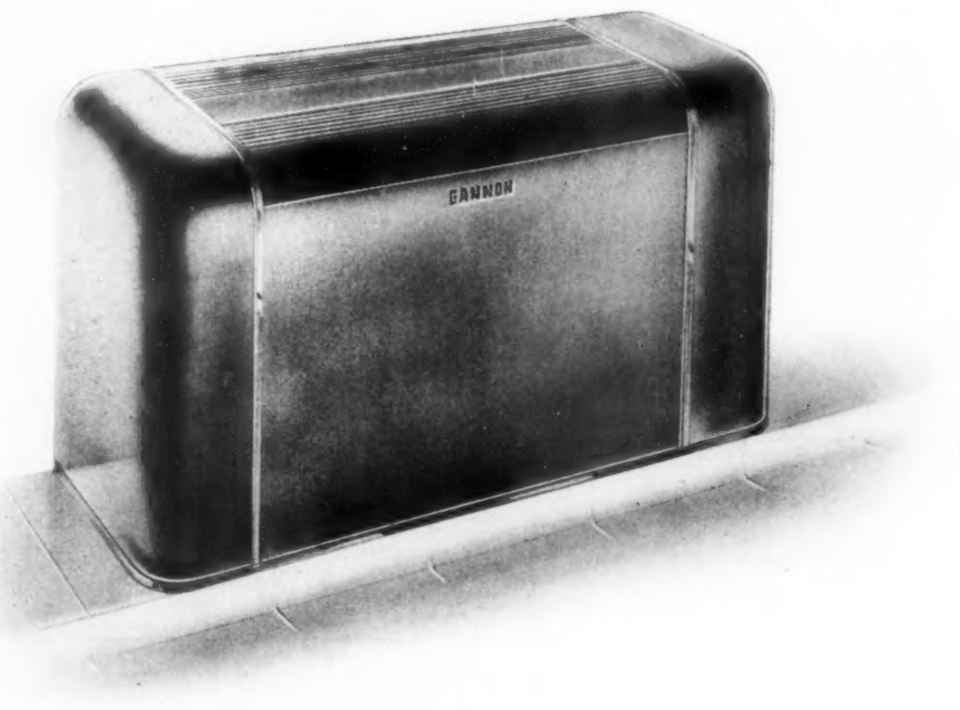


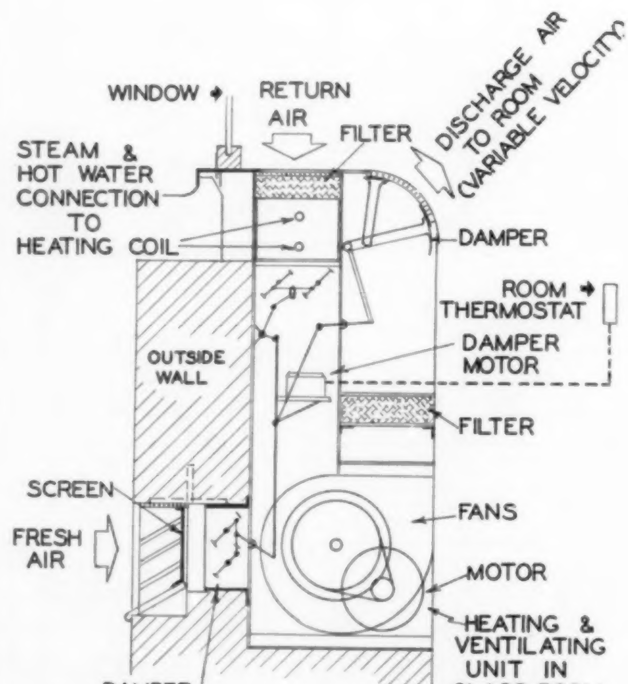
CAPACITY

MODEL 3V	C.F.M.	EXT. STATIC	H.P.	B.T.U. 2# STEAM 60° ENT. AIR
3-7-25	2,500	3/8"	1/3	162,000
3-9-40	4,000	3/8"	3/4	260,000
3-12-60	6,000	1/2"	1 1/2	394,000
3-15-80	8,000	1/2"	2	525,000

DIMENSIONS

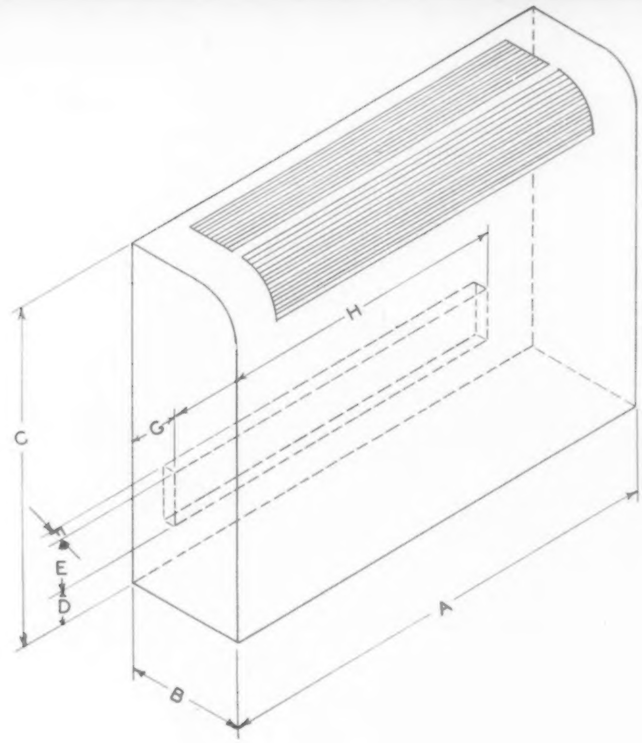
MODEL 3V	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
3-7-25	60	14	60	5 1/2	35	4	14	1 1/2	1 1/2	11 1/2	1	10	40	10	2
3-9-40	76	18	60	6	50	3	15	2	2	10	6	10	60	8	2
3-12-60	89	24	66	7	61	4	15	2	2	15	7	16	80	4 1/2	2
3-15-80	119	30	72	8	83	4	22	2	2	15	13	16	100	9 1/2	2





UNDER WINDOW HEATING AND VENTILATING UNIT FOR SCHOOLS

Air velocity, direction and aspect ratio changed by automatic control from room temperature. Result—good distribution of heat and fresh air.

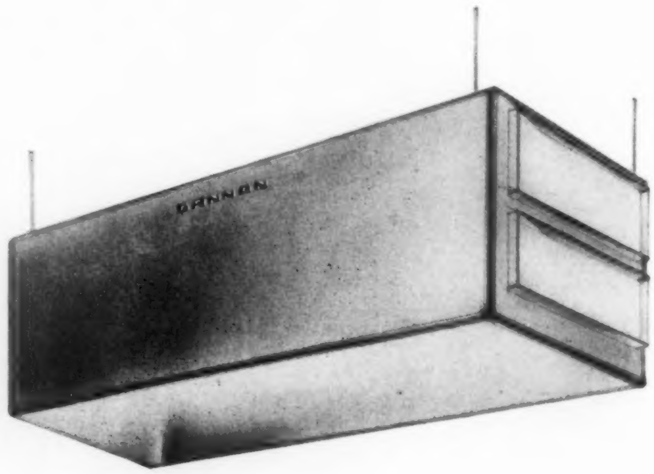


CAPACITY

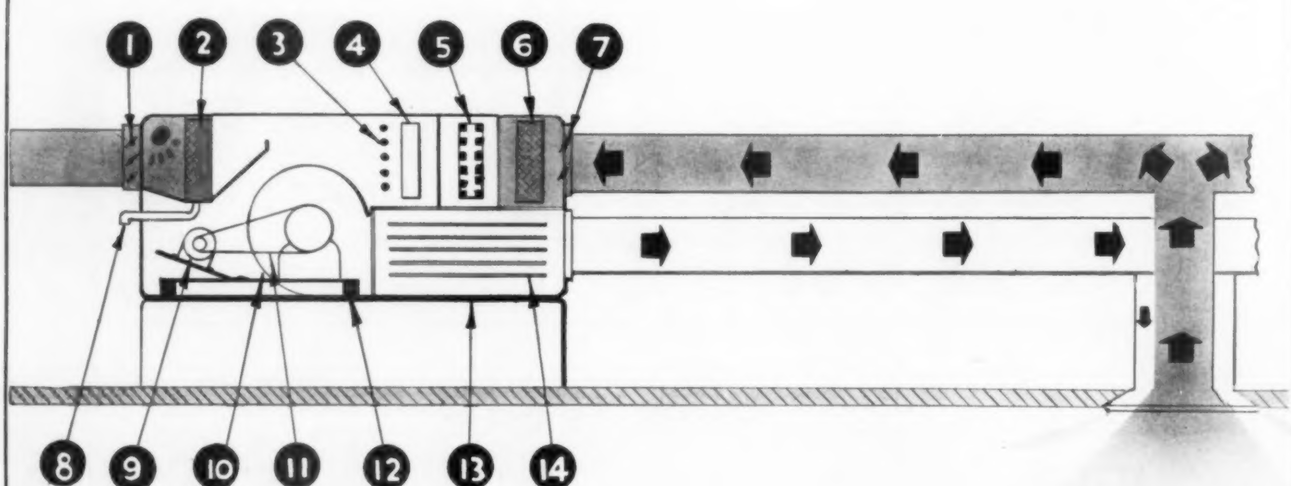
MODEL W	C. F. M.	H. P.	B.T.U. 2# STEAM 60° ENT. AIR
2-7-15	1,500	1/4	100,000
3-7-25	2,500	1/3	162,000
3-9-40	4,000	3/4	260,000
3-12-60	6,000	1	392,000

DIMENSIONS

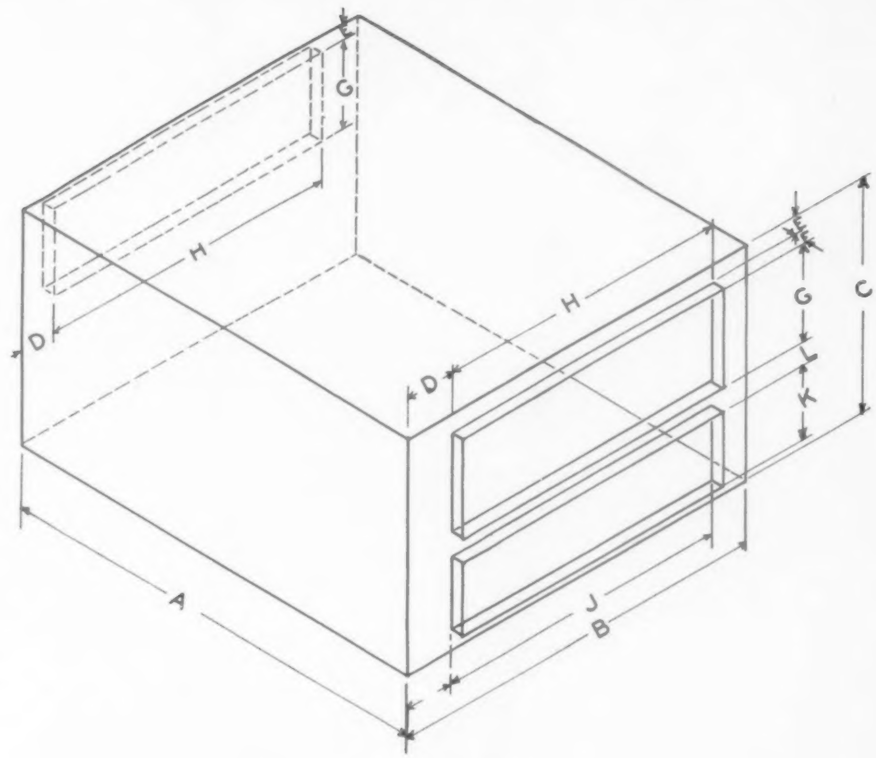
MODEL W	A	B	C	D	E	F	G	H
2-7-15	60	13	$33\frac{1}{2}$	4	6	3	$11\frac{1}{4}$	$37\frac{1}{2}$
3-7-25	73	13	$33\frac{1}{2}$	4	6	3	$11\frac{1}{4}$	$50\frac{1}{2}$
3-9-40	76	18	$33\frac{1}{2}$	6	9	4	12	50
3-12-60	89	24	48	8	12	6	15	66



HEATING AND VENTILATING UNIT
MODEL HA



1. DAMPER
2. FRESH AIR COOLER-FILTER
3. AIR PURIFIER
4. STEAM-HOT WATER COIL
5. COOLING COIL
6. FILTER
7. DAMPER
8. AIR WASH DRAIN
9. MOTOR
10. FAN
11. DRIVE
12. ISOLATORS
13. HOUSING
14. ACOUSTICAL CHAMBER

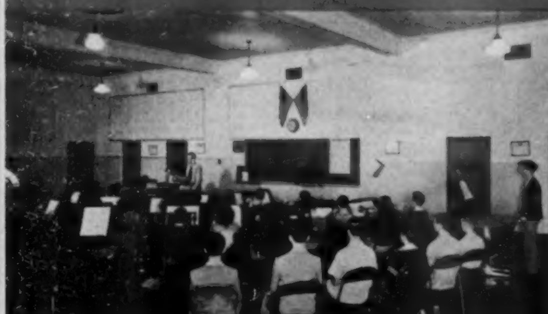


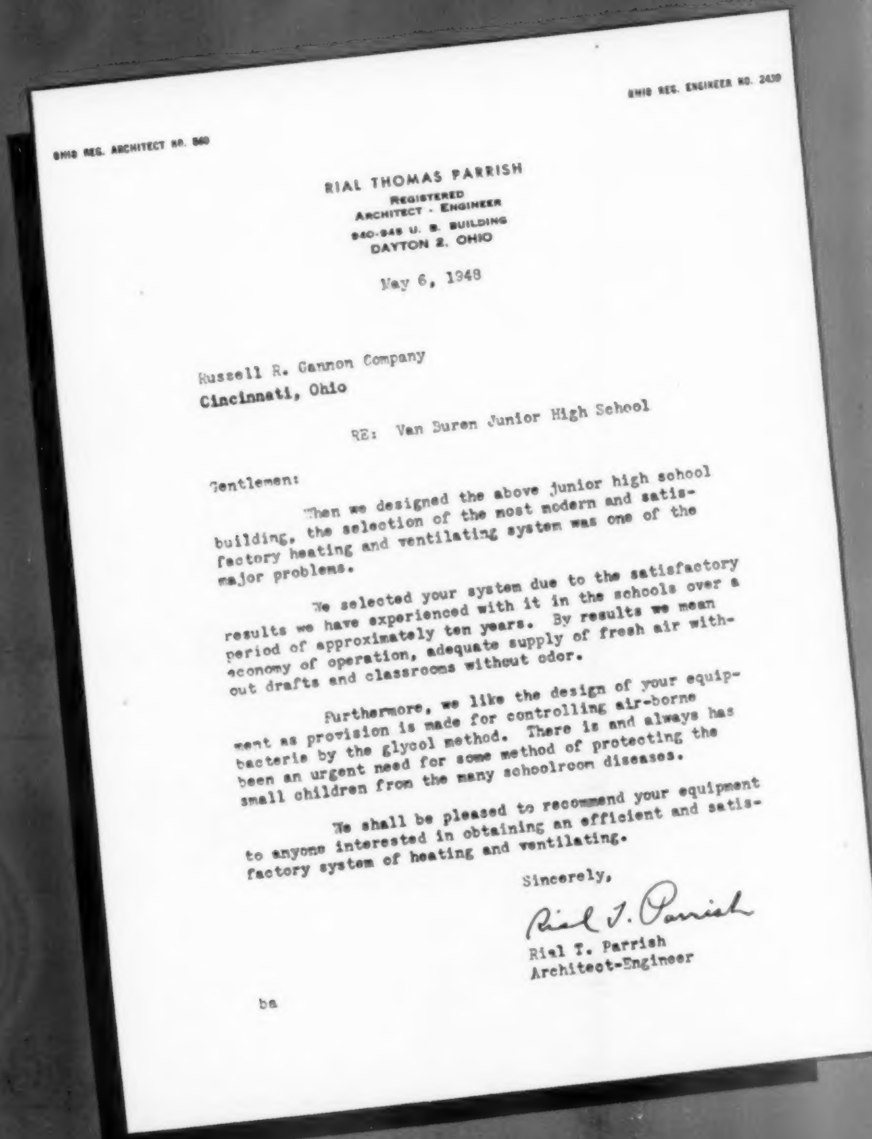
CAPACITY

MODEL HA	C.F.M.	EXT. STATIC	H.P.	2# STEAM B.T.U. 60° ENT. AIR
2-10-20	2,000	1/4	1/3	130,000
2-12-40	4,000	3/8	3/4	260,000
2-15-60	6,000	3/8	1	390,000
2-18-80	8,000	1/2	1 1/2	520,000
2-21-100	10,000	1/2	2	650,000

DIMENSIONS

MODEL HA	A	B	C	D	E	F	G	H	I	J	K	L
2-10-20	50	48	28	4	2	1 1/2	20	40	4	40	6	2
2-12-40	56	54	34	7	2	1 1/2	20	40	7	40	8	2
2-15-60	60	68	40	10	2	1 1/2	24	48	10	48	10	2
2-18-80	68	84	48	10	2	1 1/2	30	64	10	64	12	2
2-21-100	72	96	52	8	2	1 1/2	30	80	8	80	16	2





OHIO REG. ARCHITECT NO. 840

OHIO REG. ENGINEER NO. 2439

RIAL THOMAS PARRISH
REGISTERED
ARCHITECT - ENGINEER
840-848 U. B. BUILDING
DAYTON 2, OHIO

May 6, 1948

Russell R. Gannon Company
Cincinnati, Ohio

RE: Van Buren Junior High School

Gentlemen:

When we designed the above junior high school building, the selection of the most modern and satisfactory heating and ventilating system was one of the major problems.

We selected your system due to the satisfactory results we have experienced with it in the schools over a period of approximately ten years. By results we mean economy of operation, adequate supply of fresh air without drafts and classrooms without odor.

Furthermore, we like the design of your equipment as provision is made for controlling air-borne bacteria by the glycol method. There is and always has been an urgent need for some method of protecting the small children from the many schoolroom diseases.

We shall be pleased to recommend your equipment to anyone interested in obtaining an efficient and satisfactory system of heating and ventilating.

Sincerely,

Rial T. Parrish

Rial T. Parrish
Architect-Engineer

ba

A Few Typical Applications of Gannon Equipment

- Industrial plants where critical results are required combined with economy of operation.
- Commercial installation where maximum comfort is demanded at minimum cost.
- Theatres where a combination of economical first cost, operating cost, and modern comfort are definite "musts."
- School auditoriums, gymnasiums, and other public assembly halls where an economical combination of efficient heating, ventilating, and cooling are essential.

Russell R. GANNON Co.
AIR CONDITIONING EQUIPMENT
OFFICES IN PRINCIPAL CITIES Cincinnati 2 · Ohio

HIRSCHMAN-POHLE CO., INC.

Successor to W. F. HIRSCHMAN CO., INC. Established 1908

40 Lent Avenue Le Roy, New York

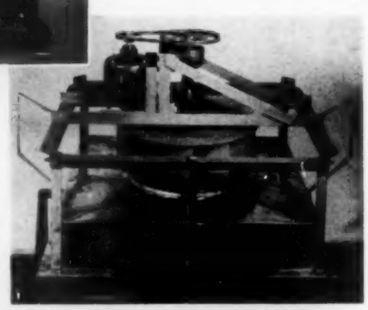
Schoolhouse VENTILATION Specialties

A complete line of "Through-the-Roof" ventilation equipment widely used on modern school and college buildings. These are a few of our types for which we will be pleased to furnish further information on request—or offer suggestions to solve any ventilation problems you may have.

HIRSCHMAN "STATICK" Power Ventilator

A Pressure Exhauster using backward curved blade fan wheel with non-overload features.

STATICK Power Ventilator completely assembled.



STATICK Power Ventilator showing cowling removed.

The STATICK Power Ventilator has been especially designed as a pressure exhauster for roof mounting, and its use conserves much valuable space within the building in addition to reducing installation costs. It uses the conventional backward curved blade type of fan that will not overload the motor at any static pressure. This type of fan is recognized by fan engineers as the proper design for straight (flat) horse-power curve.

In our standard construction the motor is mounted above the fan wheel and out of the path of the exhausted air. The entire fan and motor assembly is mounted on rugged welded steel angle frame by means of vibration absorbers. Motors used are of standard manufacture designed for vertical operation, ball-bearing, fully enclosed, continuous duty. The cowl itself has been designed to permit unrestricted air outlet and to present a pleasing appearance. Either the top cone or the entire cowl are removable for servicing fan and motor. The units can be furnished in galvanized steel, copper, aluminum, or other available materials.

CAPACITY TABLE

FOR SILENT OPERATION REQUIRED BY SCHOOLS

STATICK POWER VENTILATOR

Special Low Speed Capacity Table Suitable for Schools, Hospitals, etc.

Size	Motor HP	Fan RPM	Minimum CFM—Static Pressure (inches water)					
			1/8"	1/4"	3/8"	1/2"	5/8"	3/4"
1S	1/6	800	1045	900	800	700	600	480
2S	1/6	720	1290	1100	1000	900	800	700
3S	1/4	600	1860	1600	1480	1330	1190	1000
4S	1/4	514	2540	2280	2000	1860	1670	1450
5S	1/4	450	3300	2980	2690	2370	2140	1850
6S	1/3	400	4180	3760	3350	3000	2700	2400
7S	1/3	360	5160	4600	4100	3700	3300	2900
8S	1/2	327	6240	5600	5000	4500	4000	3500
9S	1/2	300	7420	6700	6000	5400	4900	4400
10S	3/4	270	9100	8200	7400	6700	6000	5200
11S	3/4	247	11000	10000	9000	8000	7000	6000
12S	1	222	13670	12300	11000	10000	9000	8000
13S	1	200	16600	15000	13500	12000	10800	9400
14S	1 1/2	182	20300	18000	16000	14200	12800	11000
15S	1 1/2	164	24800	22200	20000	18000	16000	14000

All above units belt-driven.
Capacities at 1/8" sp. are for fan inlet velocity of 1000 fpm.
Fan tip speeds of all are between 2800 and 2830 fpm.

The units can be furnished with or without dampers, as desired. Dampers can be furnished of the self-acting type, or for chain, electric or pneumatic control.

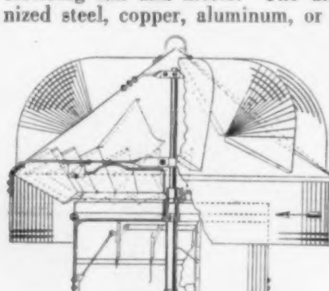
Capacities

The capacities shown are not intended to cover the entire range, but are those that may be considered as standard for quiet operation in the most commonly used sizes. Data for any capacity not shown will be gladly furnished on application.

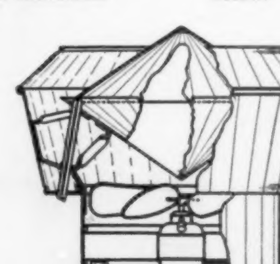
Bases and Steel Curbs

Standard sizes of bases either for the Hirschman Double sheet steel curb, or for the built-up curb, make for economy, but bases can be furnished of any size required to fit your roof opening.

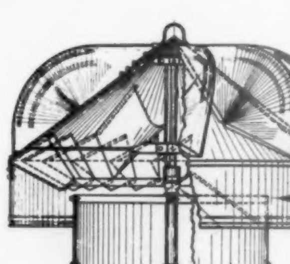
If desired, the entire unit in the smaller sizes can be built so as to open up on hinges at the curb, for access to dampers or ducts below.



Effico Wind-Electric Full Automatic Ventilator 100% Constant



Hirschman Type F Non-automatic Electric Ventilator



Effico Rotary Ball-bearing Ventilator Gravity Only

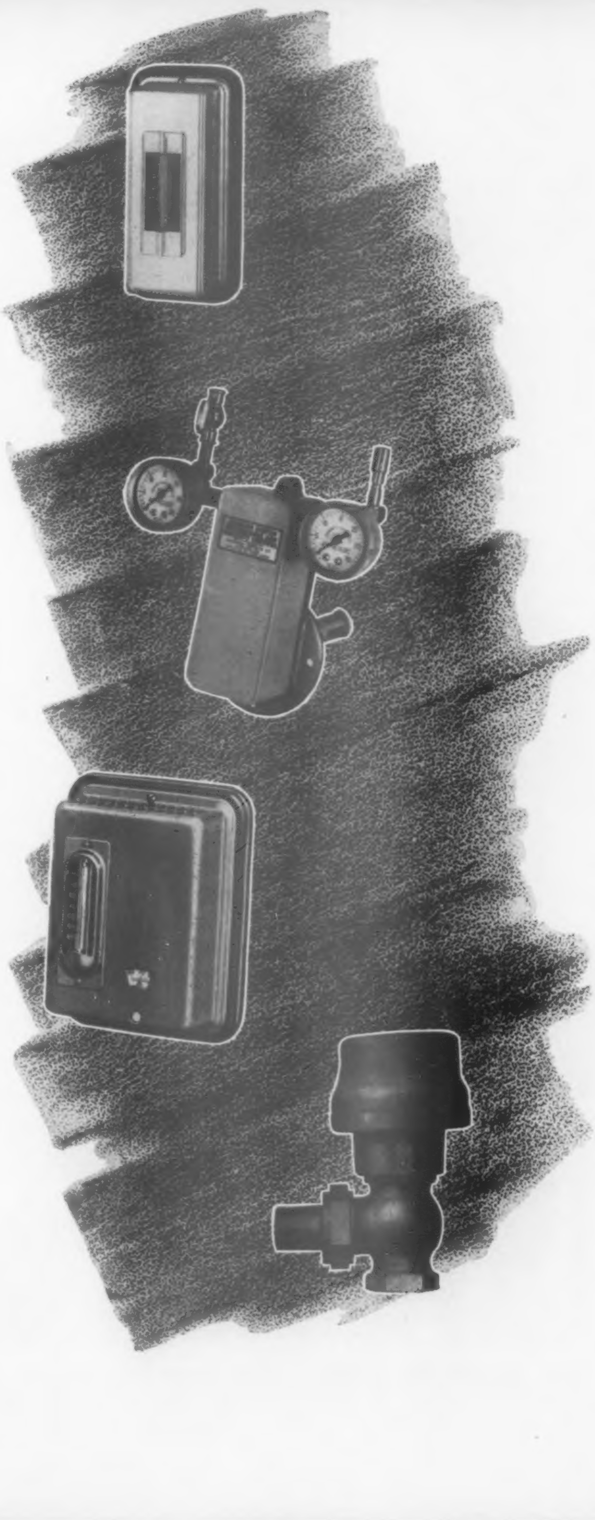
JOHNSON SERVICE COMPANY

Milwaukee 2, Wisconsin

BRANCHES IN ALL PRINCIPAL CITIES

TEMPERATURE CONTROL EQUIPMENT *by* JOHNSON

for MODERN SCHOOLS *and College Buildings*



THERE are three general methods of heating and ventilating modern school buildings. In order that all the elements which enter into these systems may be correlated properly and function in correct sequence, it is essential that a complete, unified system of automatic temperature control be installed, as developed by Johnson. No unrelated collection of devices sold "over the counter" and installed by mechanics not familiar with the type of work, will give satisfaction.

1. THE COMBINATION OR "SPLIT" SYSTEM

Heating consists of direct radiators, generally of sufficient size to offset the heat loss from the exposed wall and glass surface. Ventilation requirements are met by indirect radiation of sufficient capacity to warm the air, which is delivered by the duct system.

2. "UNIT" SYSTEM

Direct radiators partially offset the heat loss from the exposed wall and glass surface, and an indirect radiator in the unit ventilating machine furnishes the additional heat necessary and provides for ventilation requirements.

3. BLAST OR "INDIRECT" SYSTEM

A mixture of outdoor and return air is drawn into the combined heating and ventilating system and then forced through automatically controlled heating coils or tempered air by-pass into warm and tempered air chambers. Double Mixing Dampers in the individual duct to each room are controlled by a room thermostat, insuring the proper temperature for each space.

All of the requirements for automatic control of these systems have been carefully worked out by Johnson. Write for booklet with detailed descriptions and illustrations of the three methods of heating and ventilation in modern schools.

THE MERCOID CORPORATION

4207 W. Belmont Avenue Chicago, Illinois

★

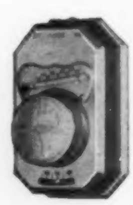
MERCOID

The Only 100% Mercury Switch Equipped Controls

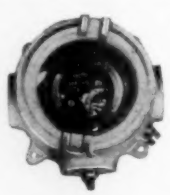
FOR HEATING, AIR CONDITIONING, REFRIGERATION AND VARIOUS INDUSTRIAL APPLICATIONS

There is scarcely an industry that is not using a Mercoid Control somewhere on vital applications in the control of temperature, pressure, liquid level, mechanical operations, etc. ★ The reason is based on their record for dependable operation and long service. They are easy to install, adjust and require practically no attention ★ The hermetically sealed mercury switches used in all Mercoid Controls are dust, dirt and corrosion-proof, thus assuring positive performance under all operating conditions. These mercury switches are also available to the trade in various types for different applications ★ If you have a switch or control problem, let Mercoid engineers give you the benefit of their wide experience.

Below are a few items briefly described. See catalog No. 600 for the complete line and further information. A copy will be sent upon request.



LINE VOLTAGE THERMOSTAT
The No. 855 thermostat is used for line voltage applications where it is desired to handle the full motor load directly without the use of a relay. Available with "on-off" manual switch for unit heater applications.



EXPLOSION-PROOF CONTROL CASES
For use with various Mercoid Controls to be installed in hazardous locations, such as oil refineries, ammunition plants, flour mills, or where dust or vapors form an explosive mixture with air.

PRESSURE CONTROLS
For numerous industrial applications. The outside double adjustments eliminate guesswork when setting controls. Indicators show the operating range on the calibrated dial. Available in many pressure ranges for direct or remote connections.

MERCOID POWERSTAT
Positive automatic pilot protection on gas burning ovens, furnaces, space heaters, or other types of gas burning appliance, including gas-ignited oil burners. Three to five seconds are required to open or close the circuit.

DIAPHRAGM CONTROLS
For low pressures where regulation is required in inches of water, either pressure or vacuum. They are used to regulate gas pressures, as safety or signalling devices; also with air circulating fans on recirculating ovens, etc.

LIQUID LEVEL CONTROL
Designed for industrial applications for controlling low specific gravity liquids, liquids which would be corrosive to brass or copper, or liquids at high pressure. Available with various circuit arrangements. May also be equipped with explosion-proof housing.

LEVER ARM AND FLOAT CONTROLS
These controls have a variety of applications where it is desired to mechanically open and close electric circuits. Mercoid float controls are used for maintaining fluid levels in tanks or for control of sump pumps or cellar drainers. The counterbalanced type is used on tanks where there is a surge in liquid. The plunger type is used on closed tanks.

REMOTE STEM TEMPERATURE CONTROLS
For control of liquids or gases, such as air, oil, water, paraffin, glue or distillate vapors and many other industrial applications. The control is equipped with convenient outside double adjustments.

TRANSFORMER-RELAYS
Type V is a reliable low voltage mercury contact relay which also acts as a transformer inducing low voltage (24 volts) on the pilot circuit. There is no hum or chatter. Used for all types of automatic equipment. Available in various voltages, cycles and circuits.

MODINE MANUFACTURING CO.

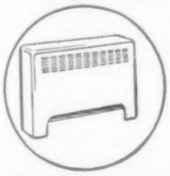
1618 DeKoven Avenue, Racine, Wisconsin

Specify Modine and you specify the BEST in modern heating

Modine Convectors give you — not just Radiant Heating — not just Convection Heating — but a Blended Combination of Both!

A modern, blended heating system for modern winter comfort. A heating system that gives you individual room control . . . gentle, draft-free air circulation without the use of moving parts that wear out! Yes, the dependable heating comfort, distinctive charm, space saving, cleanliness and long service life of Modine Convector Radiation is recommended for all types of institutional heating needs!

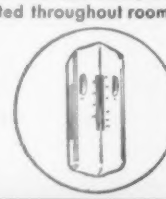
Modine Convectors give you 1) Radiant Heat (represented by black arrows) in just enough quantity to offset window heat loss, plus 2) Convection Heating: Cooler floor-line air (white arrows) is drawn into convector; warmed by copper heating unit, air rises, and is gently circulated throughout room (broken arrows).



Attractive functional design adds beauty to rooms—eliminates intrusion of conventional radiator.

Only 25% as heavy as conventional radiators, easy to install, no more in cost.

Can be recessed under windows to increase usable space, add to cleanliness of room.



Respond almost instantly to temperature controls, no "cold 70°", rooms heated quickly, easily.

Modine Unit Heaters — First with great new features that Make Them Number One on the Market!

The new line of Modine Unit Heaters offers you three separate and distinct types, developed as a matching, integrated line with 47 basic capacities: 1) Horizontal Delivery Type for general applications — 2) Vertical Delivery Type for overhead installations — 3) New Power Throw Type for specialized use.

No matter what the room area, regardless of outside temperatures, unit heaters can be installed to meet comfort requirements, avoid over-heating and unnecessary fuel waste. Like lights, units can be switched on manually or thermostatically when heat is needed.

Modern, up-to-the-minute style and beauty . . . improved heating performance . . . a broad new range of installation opportunities — that's what you get with the new Modine Unit Heater Line! Horizontal type shown above is most popular unit heater and is available in 23 models.

Vertical Delivery—16 models designed for overhead installation near ceilings or at low levels, as required.

Power Throw — 8 models designed for specialized applications where long distance heat penetration is needed.

Modine Heating and Cooling Coils — engineered for top efficiency in air conditioning systems for large and small buildings.

Look for Modine's representative in "Where to Buy It" section of your phone book, or write for descriptive literature.

MORSE BOULGER DESTRUCTOR CO.

205-U East 42nd Street, New York 17, N. Y.

AGENTS IN PRINCIPAL CITIES

PRODUCTS

Incinerators of all types for the destruction of garbage and rubbish, and anatomical wastes from infirmaries or laboratories, in combination or separately. General types are Cell and Hearth for General Medium and Heavy Duty Service (Morse Boulger); Flue-Fed for Multiple Floor Service in Buildings (Kernerator); Ready-Built (Bricked-in or Portable) for Basement Service in Buildings (Kernerator).

Send for literature.

MORSE BOULGER INCINERATION

All authorities agree that the complete destruction by incineration of trash before it accumulates is the best way to safeguard school buildings from fire. They also agree that the incineration of garbage and anatomical wastes from kitchens, laboratories and infirmaries is the surest way to destroy any disease carrying elements and to eliminate flies and odors. The design of Morse Boulger Incinerators is such as to provide complete destruction of all combustible products.

ENGINEERING SERVICE

We can offer school authorities nearly sixty years of the broadest experience in the field of incineration, including problems peculiar to schools, colleges and institutions. Our engineers will be glad to discuss your problems with you or your architect-engineer and recommend the best type of incineration to take care of your school's requirements. Keep in mind it is usually practicable to handle both wet and dry wastes in the same incinerator provided it is designed properly for such combination service. Morse Boulger Incinerators may be arranged for oil, gas, coal or wood firing or, where dry trash only is handled, will often operate without fuel.

GUARANTEE

Morse Boulger Incinerators are guaranteed as to correctness of design, materials, workmanship and performance. Morse Boulger Destructors are installed by our own skilled field crews.

MORSE BOULGER INCINERATORS

TYPE A . . . This incinerator, being a general utility unit where proportions of rubbish and garbage may vary widely, is probably the best of our several types for handling school destructible wastes. It will usually handle without auxiliary fuel any combination of dry rubbish and wet garbage up to 50% garbage content. Wet garbage up to 60% of rated capacity can be burned with oil, gas, coal or wood as the fuel. The incinerator can be located in the basement or housed in a separate small building.

The Type A Morse Boulger Incinerator comes in 6 different standard sizes, with capacities (based on dry rubbish) ranging from 125 to 900 pounds per hour. Larger sizes are available. If the Type A Incinerator will not take care of your problem, we have numerous other types of incinerators each best for handling certain kinds of wastes.

KERNERATORS

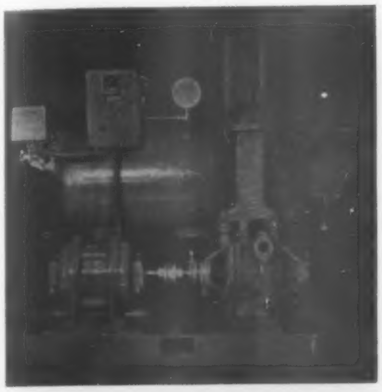
Where incineration requirements call for multiple floor service, as in a school infirmary for example, the Flue-Fed Kernerator would probably be best. As many floors as desired can be accommodated, each floor having its own hopper door in a common chute which leads to the incinerator in the basement. If the material is not self-combustible, as with dry trash and rubbish, arrangements can be made to fire the unit with gas, wood or coal.

Another Kernerator finding wide use in small buildings such as dormitories, etc., is the Ready-Built Type. This comes either "bricked-in" and connected directly to the furnace chimney or the "portable" type which is set anywhere on the basement floor and connected to the chimney by ordinary furnace piping. Both types are gas fired when the material destroyed is not self-combustible.

THE NASH ENGINEERING COMPANY

222 Wilson Road South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES



JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. Jennings Pumps remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent pumping units are combined in a single casing—an air unit which handles only air, and a water unit which handles only water. The capacity of each unit is simultaneous capacity. Each handles the full rated capacity independent of the other. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R. Bulletins on request.

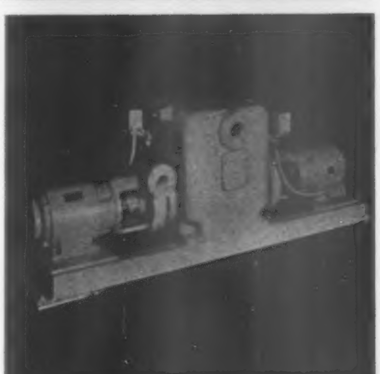
JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the Standard Jennings Return Line Heating Pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current.

The Jennings Vapor Turbine is a safe heating pump, for it functions as long as there is steam in the system, entirely independent of electric current failure. Ideal for Greenhouse, School, and Hospital service.

Furnished standard in capacities up to 150,000 sq. ft. E.D.R. Bulletin on request.



JENNINGS CONDENSATION PUMPS

Jennings Condensation Pumps remove condensation from radiators in return line steam heating systems and pump condensation back to the boiler.

Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

They efficiently remove condensation from radiators, particularly those set below the boiler water line level. Pump casing forms part of return tank, making a compact structure that conserves floor space. Rectangular construction permits installation in corner or against wall.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation. Bulletin on request.

JENNINGS SUMP AND SEWAGE PUMPS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing. Both are mounted on the same shaft that carries the rotor of the electric driving motor, making a compact assembly.

These pumps may be installed away from the pit, or directly over the pit. The Pedestal Type Jennings sets directly on the pit cover, requiring no other foundation.

Capacities and heads to meet all requirements. Bulletins on request.

THE HERMAN NELSON CORPORATION

General Offices and Factories at Moline, Ill.

BRANCH OFFICES AND PRODUCT APPLICATION ENGINEERS IN PRINCIPAL CITIES

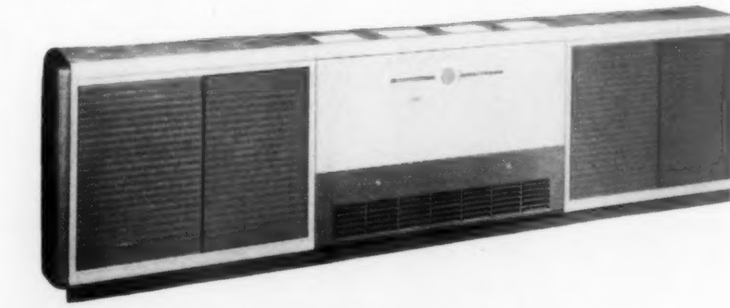
MAINTAIN PROPER SCHOOLROOM AIR CONDITIONS with HERMAN NELSON UNIT VENTILATORS

9 IMPORTANT POINTS OF SUPERIORITY CONTRIBUTING TO BETTER SCHOOLROOM HEALTH AND COMFORT

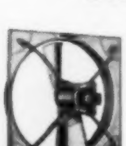
1. **FLOATING HEATING ELEMENT** with one end of each tube riding free. Cannot be damaged by expansion and contraction. Internal tubes assure uniform distribution of steam within heating element.
2. **PRESSURE EQUALIZING UNIT** between heating element and return line allows gradual throttling of steam supply — prevents by-passing of steam.
3. **CONDENSATE COOLING SURFACE** prevents flooding of heating element and backing up of condensate in the heating element thus preventing uneven distribution of steam and "water-hammer".
4. **MODULAR FAN UNITS** assure uniform tip speeds and outlet velocities on all sizes of units.
5. **SLOW SPEED, DIRECT CONNECTED MOTOR** contributes to quiet operation and assures long, dependable service.
6. **AUTOMATIC BACK DRAFT DAMPER** prevents cold air from passing through room air grille. It is held open when unit is not in operation to permit convection of heat.
7. **DEMOUNTABLE WALL INTAKE** permits an absolutely weather-tight installation. Intake opening is easily accessible for caulking wall opening.
8. **INTEGRAL DESIGN OF CABINET** permits the unit ventilator to be used by itself or as a section of a group including utility cabinets and convectors. Utility cabinets can be added at any future date.
9. **WELDED CABINET CONSTRUCTION** assures modern, structural strength. Front panels and ends are removable for easy access to all parts during installation.

INTEGRAL DESIGN OF UNIT ALLOWS CONTINUOUS CLASSROOM FLEXIBILITY

The integral design of the Herman Nelson Unit Ventilator enables this product to be used either alone or as part of a group including convector and utility cabinets. Utility cabinets may be added at any future date to make an attractive, useful ensemble. Any combination of units is always finished on the ends so that it is not necessary to line the entire wall with shelving.

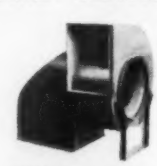


OTHER HERMAN NELSON HEATING AND VENTILATING PRODUCTS



HERMAN NELSON PROPELLER FANS
For solving ventilating problems in kitchens, cafeterias, etc.

LARGE CAPACITY VENTILATORS
For maintaining desired air conditions in large auditoriums, gymnasiums, etc.



HERMAN NELSON UNIT BLOWERS
For ventilating and air conditioning applications such as toilets and laboratories.

HERMAN NELSON PROPELLER-FAN TYPE UNIT HEATERS
For efficient, economical heating of large gymnasiums, locker rooms, etc.

Since 1906 manufacturers of quality heating and ventilating products

JOHN J. NESBITT, INC.

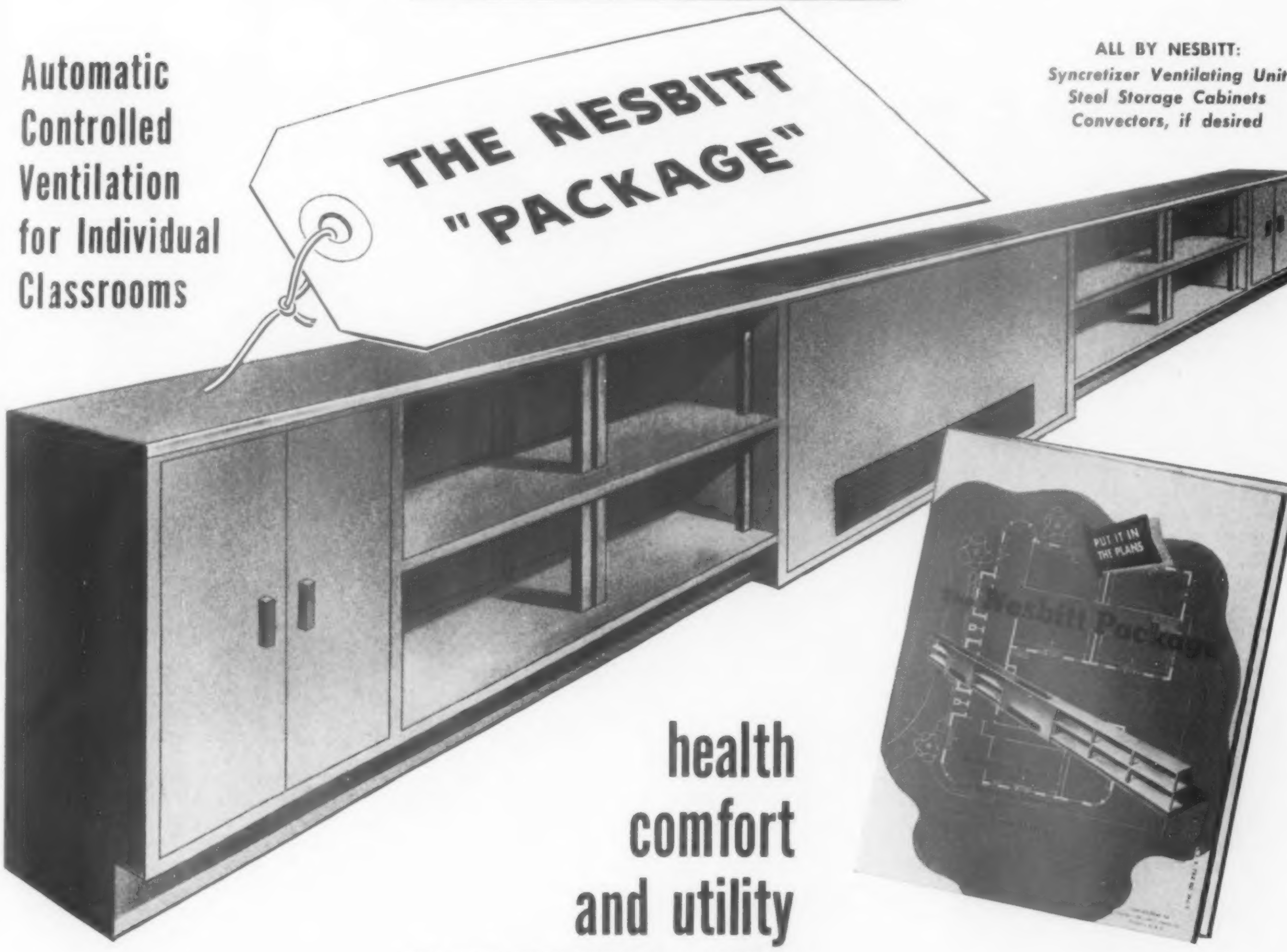
Manufacturers of

Heating, Ventilating and Air Conditioning Equipment

State Road and Rhawn Street Philadelphia 36, Pa.

Automatic Controlled Ventilation for Individual Classrooms

ALL BY NESBITT:
Syncretizer Ventilating Unit
Steel Storage Cabinets
Convectors, if desired



health comfort and utility

IN ONE WINDOWLINE ASSEMBLY

Draftless fresh air without overheating The Nesbitt Syncretizer Unit Ventilator automatically brings in a continuous supply of fresh outdoor air . . . syncretizes (harmonizes) it with room air . . . and circulates it to maintain a pleasant, comfortable June-like condition even when the outside temperature is below zero. With dual controls, the Syncretizer prevents both cold drafts and overheating. It delivers some outdoor air to occupied classrooms at all times (the minimum quantity may be fixed). The air-stream control makes certain that the outdoor air is tempered within the unit to a draftless minimum temperature. The room control assures that the air discharged by the unit will maintain uniformly the desired room temperature and avoid wasteful, unhealthful overheating.

Beauty, performance, convenience The Syncretizer may be installed alone (pictured lower right) or in combination with Nesbitt metal shelving or storage units (pictured above). Convector units for integral assembly are available for the few cases where extra radiation may be deemed advisable. Nesbitt equipment is noteworthy for quality of construction, quietness of operation, and economy of fuel.

SERIES B THERMOVENTS are supplied by Nesbitt for heating and ventilating auditoriums, gymnasiums, assembly halls, etc.

Sold by John J. Nesbitt, Inc. and American Blower Corporation

FOR MORE DETAILS:

The Nesbitt Syncretizer, Ask for	Publication 231-2
The Nesbitt "Package"	Publication 249
Nesbitt Series B Thermovents	Publication 227-2
Nesbitt Engineering Data	Publication 225-2

Syncretized Air

PETROLEUM HEAT & POWER COMPANY

Main Office and Factory

Stamford, Conn.

Good Oil Burning Equipment — Since 1903 — Fuel Oils

PETRO REG. U.S. PAT. OFF.

INDUSTRIAL AND COMMERCIAL OIL BURNING SYSTEMS

FOR AUTOMATIC, SEMI-AUTOMATIC OR MANUAL OPERATION

FOR UNHEATED NO. 5 OR LIGHTER OIL

Model W-A—Automatic ignition with synchronized control of oil and air.

Model W-SA—Semi-automatic, i.e., automatic variation of firing rate with manual ignition or for manual variation and manual ignition.

FOR HEATED OILS: HEAVY NO. 5, NO. 6 (Bunker "C") OIL

Model W-AH—Automatic ignition and operation with synchronized control of air and oil and automatic control of oil heaters.

Model W-SAH—Semi-automatic with oil heaters, i.e., automatic variation of firing rate with manual ignition. Also available for manual ignition and manual control of air, oil and heater.

PETRO'S THERMAL VISCOSITY CONTROL

In burning preheated fuel oils, whether the operation be manual, semi, or fully automatic, the delivered combustion efficiency depends primarily on the flow rate of oil delivered to the atomizing cup, and this in turn depends on the oil's viscosity. The only dependable and accurate control of viscosity is through the heat applied to the oil. Petro's Thermal Viscosity System controls this heat application at its source; has been used successfully for years to burn pre-heated oils at maximum combustion efficiency without any need for frequent manual adjustment; and is the only method of burning pre-heated oils which can be called "automatic" legitimately.

MODULATED FUEL CONTROL

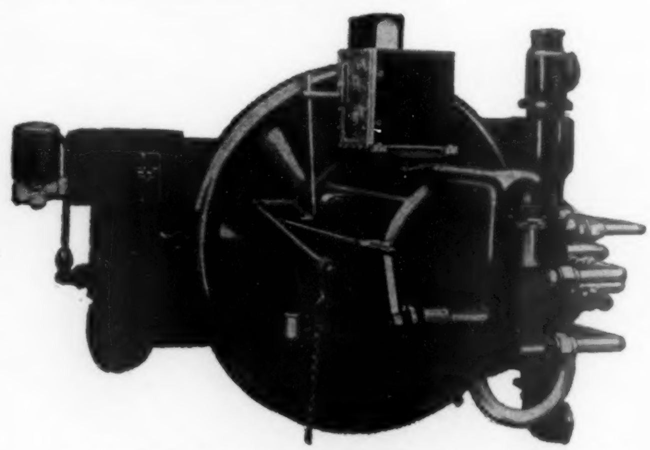
For Automatic or Semi-automatic operation with either unheated or pre-heated fuel oils, the modulating control provides accurate and completely automatic control of high-low operation which permits automatic low fire starting and modulation or acceleration of firing to meet fluctuating steam demands: maximum combustion efficiency at every stage of firing. Illustration shows modulating motor as mounted on burner (when specified) and arms and linkage through which constant fire-regulation is maintained.

This Burner is a self-contained assembly of motor, fan, pump, rotary cup atomizer and all air and oil adjustment apparatus.

Interlocking air and oil control mechanism permits any minimum or maximum operation required within the burner's range of operation. Counter-flow Angular Air Vanes at nozzle increase air and oil turbulence and aid efficient combustion of heavy fuel oils.

Special oil adjustment valve meters oil to rotary cup, yet permits manual operation without disturbing permanent burner adjustment.

Removable rotary cup and nozzle permit changing shape of flame to suit requirements of any boiler and prevent flame impingement.



Model W. Direct Driven, Rotary Cup Type Burner. Modulating Motor Shown Is Supplied as an Extra When So Ordered

Oil pump is a slow speed, permanently packed, self-priming, self-aligning, non-binding or clogging mechanism, assembled as an integral part of burner. Burners also available without integral pump. Motor is cooled by induced circulation of air. Armature shaft is mounted on two deep-groove annular ball bearings. Splash lubrication from the sump which is below the pump drive lubricates all bearing surfaces in the burner

CAPACITIES
Calculated at Boiler Efficiency of 75%

Model	Motor H.P.	Max. Gals. per Hour	Rated Capacity Boiler H.P.	Sq. Ft. C. I. Steam Radiation *
W-2½	⅓	11	37	5,150
W-3	½	15	50	7,030
W-4	½	25	84	11,720
W-5	1	33	110	15,470
W-6	2	45	151	21,100
W-7	2	62	208	29,100
W-8	3	100	336	46,600
W-9	3	145	487	68,000

W-2½ to W-9 burns No. 5 fuel oil of 300 seconds maximum viscosity at 100° F. Saybolt Universal or any lighter oils without preheating. When heavier No. 5 or No. 6 (Bunker "C") fuel oil is used, preheating is required. Models W-2½, W-3 and W-4 burners are regularly supplied for operation on single phase, 110 or 220 volt, 50 or 60 cycle. Model W-5 single phase, 220 volt, 50 or 60 cycle.

All models, 220, 440, 550 volt, polyphase, 50 or 60 cycle:

W-2½ to W-8 belt driven type is available in 25, 30 and 40 cycle A.C. for all standard voltages, single or polyphase; also 115-230 volt D.C.

(*) Equivalent Direct Cast Iron Steam Radiation measured at the boiler outlet.

The above data on Petro Industrial Burners are condensed from the complete Industrial Burner Catalog which will be sent gladly on request.

Send for Catalog of Petro Commercial and Industrial Oil Burners

OLDEST AND LARGEST ORGANIZATION IN THE WORLD DEVOTED EXCLUSIVELY TO OIL HEATING

PETROLEUM HEAT & POWER COMPANY

Main Office and Factory

Stamford, Conn.

Good Oil Burning Equipment — Since 1903 — Fuel Oils

PETRO
REG. U.S. PAT. OFF.

DOMESTIC OIL HEATING EQUIPMENT

PRESSURE ATOMIZING DOMESTIC BURNERS

PETRO P-20 Burner

CAPACITY TABLES

Burner Model Number	Nozzle Size Gal. Per Hr.	* Total Capacity Steam Sq. Ft.	Hot Water ** Sq. Ft.	App. Sh'p'g. Wgt.
P-20-A	1.00	350	560	155
P-20	1.25	435	695	155
	1.35	470	750	
	1.50	525	850	
	1.65	575	920	
	2.00	700	1120	
	2.50	875	1400	
P-21	2.00	700	1120	160
	2.50	875	1400	
	3.00	1050	1680	
	3.50	1225	1960	
	4.00	1400	2240	
	4.50	1575	2520	
P-22	3.00	1050	1680	170
	3.50	1225	1960	
	4.00	1400	2240	
	4.50	1575	2520	
	5.00	1750	2800	
	5.50	1925	3080	
	6.00	2100	3360	
P-12	6.00	2100	3360	215
	6.50	2275	3640	
	7.00	2450	3920	
	7.50	2625	4200	
	8.00	2800	4480	
	9.00	3150	5040	
	10.00	3500	5600	
P-13-A	9.00	3150	5040	285
	10.00	3500	5600	
	11.00	3850	6160	
	12.00	4200	6720	
P-13	12.00	4200	6720	285
	13.00	4550	7280	
	14.00	4900	7840	
	15.00	5250	8400	
	16.00	5600	8960	
	17.00	5950	9520	
	18.00	6300	10080	

* Total capacity equals standing radiation, plus piping loss, plus pickup, plus domestic hot water.

** Based upon water at a temperature of 70° in radiators.

MODELS P-20A, P-20, P-21 and P-22

In domestic heating, this group of Petro burners has wide and general application to steam, hot water, or warm air systems.

This group burns No. 3 fuel oil (or lighter), the heaviest and lowest priced fuel oil approved by Underwriters for domestic use. They are precision built pressure atomizing (or "gun" type) burners with constant electric ignition for reliable and safe operation, and may be installed with inside or outside fuel storage tanks without adding auxiliary pumping facilities. The pump on the burner is sufficient.

Capacities are shown in the adjacent table. If there appears to be any question about the model or size which should be applied to any specific system, it is recommended that the order (or inquiry) specify the type, size, and rating of the boiler or furnace to be fired, together with the total load. Petro's engineering department will then specify the right burner for best operation.

LARGE CAPACITY BURNERS

Models P-12, P-13A and P-13

In addition to domestic heating in very large residences, these Petro burners have a wide field of application in commercial and public buildings, such as stores, churches, schools, garages and apartments (to mention only a few).

In the higher ranges of their capacities these large Model P burners overlap the smaller Industrial Models, but because they are designed and approved for No. 3 fuel oil, they are widely popular for large heating loads when heavier fuel oils for industrial type burners are not readily available.

PETRO P-13 Burner

Petro Boiler Units—both cast iron sectional and steel—in a range of five sizes covering normal domestic needs, and Petro Water Heaters and forced warm air furnaces are also obtainable. Information on this equipment available on request. Send for catalog of Petro Domestic Oil Heating Equipment.

Send for Catalog of Petro Domestic Oil Burners

OLDEST AND LARGEST ORGANIZATION IN THE WORLD DEVOTED EXCLUSIVELY TO OIL HEATING

THE RIC-WIL COMPANY

INSULATED PIPE CONDUIT SYSTEMS

Union Commerce Bldg., Cleveland, Ohio FACTORY: Barberton, Ohio

OFFICES IN PRINCIPAL CITIES

RIC-WIL offers Conduit for every need—

THE MOST COMPLETE LINE—MEETING ALL CONDITIONS OF SERVICE AND COST

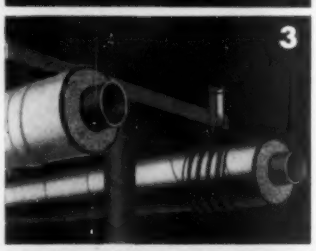
THERE IS A RIC-WIL INSULATED CONDUIT SYSTEM ENGINEERED TO THE SPECIFIC NEEDS OF SCHOOLS, UNIVERSITIES AND OTHER INSTITUTIONS FOR THE DISTRIBUTION OF STEAM AND HOT WATER — PROVIDING THE MOST EFFICIENT INSULATION AND PROTECTION

1. Ric-wiL INSULATED PIPE UNIT—SINGLE OR MULTIPLE PIPES

Prefabricated complete units with one or more pipes—in any specified combination—in helical corrugated conduit, coated and wrapped with asphalt saturated asbestos felt. 21-ft. lengths for easy installation. Insulation is applied to any or all pipes in any thickness specified.

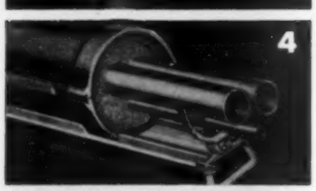
2. Ric-wiL INSULATED PIPE UNIT—FOR PROCESS LIQUIDS

An adaptation of the multiple system used where a steam or hot water line heats fluids in other lines. Pipes are insulated from the exterior but not from each other. Sizes and specifications as required—conduit same as for other insulated pipe units.



3. Ric-wiL FOILCLAD PIPE UNITS—FOR OVERHEAD LINES

Pipe and insulation are protected and waterproofed by a double coating of machine-applied, high temperature asphalt. Unit is then wrapped with asbestos felt and covered with a final spiral wrapping of copper or aluminum foil for maximum insulation and protection.



4. Ric-wiL STANDARD TILE CONDUIT

Vitrified glazed A.S.T.M. Standard Tile housing—acid- and weatherproof—with foundation type base drain supporting weight of piping through correctly engineered pipe support. For single or multiple pipe system—filler type insulation or sectional pipe covering.

5. Ric-wiL SUPER-TILE CONDUIT

Same advantages as Standard Tile but with walls approximately double-thick for strength under heavy traffic or where overhead load is above normal. Will support static load of 6 tons per wheel under actual installation conditions. Base drain of extra-heavy tile.

6. Ric-wiL CAST IRON CONDUIT

Heavy reinforced cast iron conduit for use where underground pipe lines run close to or under railroad tracks. Durable, water tight, vibration-proof, clamps for extra tightness.

7. Ric-wiL TILE CONDUIT — UNIVERSAL TYPE

Where installation conditions dictate the use of a concrete pad, Ric-wiL Universal Tile is recommended. Side walls are double-cell vitrified trapezoidal block design. Arch may be Standard Tile, Super Tile, or Cast Iron.

Ric-wiL CONDUIT ACCESSORIES. Ric-wiL accessories are available in all type systems; standard and special fittings, factory fabricated or field fabricated expansion devices, alignment guides, anchors, etc. Descriptive bulletins on request. Write: The Ric-wiL Co., Dept. 318.

STREAMLINE PIPE AND FITTINGS DIVISION

MUELLER BRASS CO.

Port Huron, Michigan

PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING BY INSTALLING *STREAMLINE* COPPER PIPE FOR THE PLUMBING AND HEATING SYSTEMS

STREAMLINE bronze solder fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

STREAMLINE Solder Fittings are manufactured under U. S. Patents 1,770,852; 1,776,502; and 1,890,998

Illustrating the Mechanical Features of the STREAMLINE Fitting on Sizes Over 2 Inches

STREAMLINE solder fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

High resistance to corrosion and clogging—Under normal conditions of soil and water, copper does not corrode or rust as iron or steel does. The absence of anchor points due to the continuously smooth waterway through pipe and fitting tends greatly to eliminate clogging.

Light Weight, yet great strength—The STREAMLINE solder fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

Minimum space required—Although STREAMLINE solder fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

Leaks due to vibration eliminated—Constant vibration has no effect on a joint made with STREAMLINE solder fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

Visible proof an exclusive feature of the STREAMLINE Fitting.—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.

The STREAMLINE solder fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws—capillary attraction—to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.

Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE solder fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillarity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

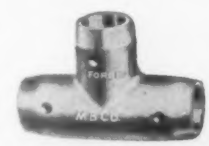
ESPECIALLY RECOMMENDED FOR HEATING PLANTS

STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—whether by hot water or steam.

If you place your hand within a couple of feet of iron or steel pipe in which steam or hot water is being conducted, you can feel the heat radiation. Try it with copper pipe and you will find that you must actually touch the pipe before you can determine whether it is hot or cold.

Copper Pipe transfers energy much quicker than iron or steel. Heat, of course, is a form of energy and in a hot water heating system or a steam heating system, the heat is transferred through the copper pipe to the radiators much quicker and with less heat loss. The reverse is also true. For instance, in large hotels where there are pipe lines circulating ice water, the temperature of the water remains lower than if it is conducted through iron or steel.

Coupling



Tee

In many cases the expense of insulating copper pipe may be eliminated. Copper will only radiate heat if inclosed in a drafthead or flue or if there is a continuous moving current of air around it. The modern concealed copper radiators which we find in buildings, generally beneath the windows, could not function unless they were inclosed so as to permit the air to travel over their surfaces by entering at the bottom and emerging at the top. A STREAMLINE system actually cuts your fuel bill.

Elbow

STREAMLINE pipe and fittings are installed in over four hundred schools and colleges throughout the United States and, in fact, in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from ¼″ to 10″.

The word STREAMLINE is the Registered Trade Mark of the Mueller Brass Co., Port Huron, Michigan

Cross

Write for Catalog.

WADE MANUFACTURING COMPANY

115 N. State Street

Elgin, Illinois

REPRESENTATIVES IN PRINCIPAL CITIES

DRAINS — WADE MANUFACTURING COMPANY — AND PLUMBING SPECIALTIES

THE NEW HYDRAFILTER

DOUBLE ACTING GREASE INTERCEPTOR

● The new Wade HydraFilter grease interceptor is a result of intensive experimentation and research to find the best possible method of separating grease from water. It operates on a revolutionary new basic principle of separation: hydraulic filtering **of** grease **by** grease. Conventional gravity separation is also employed, making the HydraFilter double-acting, with over 90% efficiency.

The HydraFilter offers many features in addition to its highly effective grease separation action, including the selective handling of all solids. Heavy solids such as broken glass, bone fragments, etc., that can obstruct drain lines, are retained in a special trough; lighter solids including peas, carrots and other food particles are given free passage through the trap over a smooth floor that cannot catch and clog with foreign matter.

Outstanding in the HydraFilter construction is its provision for complete protective venting, guarding from either an excess or lack of air and against siphoning. A complete range of sizes for school, university and hospital kitchens and restaurants is available.

Series No.	Type	Flow Rate, G. P. M.	Grease Capacity, Lbs.
W-5	W-5-13	10	20
	W-5-14	15	30
	W-5-15	20	40
	W-5-16	25	50
	W-5-17	40	80

SEALED AIR CHAMBERS

FOR PERMANENT ELIMINATION OF WATER HAMMER

● The Wade Sealed Air Chamber is the modern, effective cure for destructive water hammer in piping systems. High surge pressures, built up when a quick closing valve is suddenly shut off, are cushioned in the Sealed Air Chamber. The air cushion is sealed and permanently locked within a highly elastic metal bellows. The air chamber needs no attention; it cannot become water-logged. The sealed air cannot escape; its cushioning effect is never lost.

Units under test have successfully withstood over 69 million cycles of operation. Bellows are prevented from exceeding their elastic limit by a hydraulic lock. Inside and outside pressures are equalized by the scientific design of the bellows unit.

Installation of the Sealed Air Chamber should be made as near the origin of water hammer as possible and not more than 7 feet away. Choosing the correct size Air Chamber from Wade's range of sizes is a simple matter when using the Wade Selection Tables, the first scientifically proved data for correct Sealed Air Chamber sizing. Selection Tables are available on request.

NO. 6

NO. 13

	No.	Overall Ht.	O.D.
Sealed Air Chambers	6 Jr.	*	*
	13	9″	5 3/16″
	28	12¾″	5 3/16″
	67	22⅝″	5 3/16″
	134	39¼″	5 3/16″

* 6¼″ overall; 5⅝″ wide; 3¼″ thick.

WADE DRAINS—FOR REMODELING OR NEW CONSTRUCTION

● Included in Wade's complete line of drains and plumbing specialties are a series of dependable floor and shower drains. Drains W-1100 and W-1120 are general purpose drains recommended for all types of floor construction. The W-1100 has an improved type flashing clamping arrangement which prevents crimping and keeps the integrally cast weep holes open. An adjustable strainer, available in a wide variety of sizes, shapes and finishes, permits a maximum depth of 3¼″ and a minimum of 1½″ between body and floor level. The W-1120, furnished with a drum type integral trap, is recommended wherever a combined adjustable drain and trap is required.

An ideal drain for school, university and institutional use is the W-1100-H. It is a floor drain without a trap but with a seepage flange and large size adjustable strainer. A flashing clamping device is optional.

For additional information on any Wade product write direct to Wade Manufacturing Company for our new catalog or consult one of our representatives. They are located in all principal cities.

CRANE CO.

CRANE Plumbing and Heating, Valves, Fittings, Pipe

General Office: 836 South Michigan Avenue, Chicago 5, Illinois

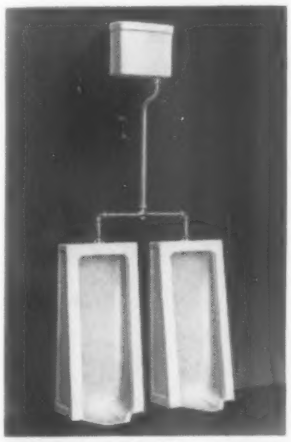
NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING DEALERS

Quality Plumbing and Heating for Every Need in Schools and Universities

Proper sanitation . . . long life . . . low maintenance costs . . . dependable service—these are the requirements of good school plumbing. And these are the requirements Crane plumbing satisfies. For as always, careful planning, expert workmanship, and sturdy construction guard the quality of Crane plumbing.

In addition to quality fixtures, the Crane plumbing line includes everything in plumbing for schools and universities—valves, fittings, and all necessary piping. Fixtures are made of vitreous china and Crane vitreous glazed Duraclay—both assure lasting beauty and ease of cleaning. All mechanical parts are ruggedly constructed to stand up under the severe usage to be expected in public washrooms.

Here are shown just a few fixtures from the complete Crane plumbing line. For further information consult your Plumbing Contractor or call your nearest Crane Branch.



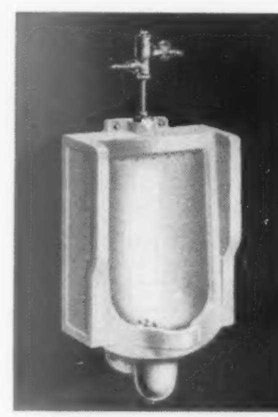
7-47—Sanitor *slope front vitreous glazed Durac'ay stall urinal. Available singly or in batteries. Supplied with vitreous china tanks with* Alert *automatic siphon valves and* Marvel *float valves. Overall width, each urinal 18".*

3-525—Santon *elongated rim, siphon jet closet with concealed pressure tank and seat-operated flush valve—open-front wood seat.*

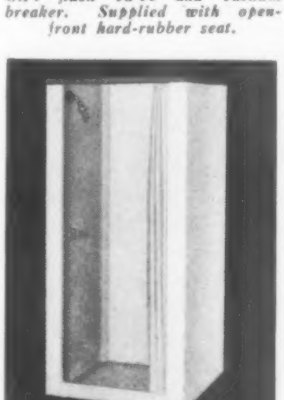
1-135—Oxford *vitreous china lavatory with beveled panel, shelf back and soap depression.* Crestmont *supply with Dial-ese Controls, direct lift waste. Sizes 19 x 17", 20 x 14", and 26 x 14".*

1-300 Yorkshire *vitreous china lavatory with shelf back and soap depression. and with* Crestmont *supply and direct lift waste with Dial-ese Controls. Sizes 18 x 15" and 20 x 18".*

3-460—Rapidway *blow-out wall-type closet with elongated rim, C.P. flush va've and vacuum breaker. Supplied with open-front hard-rubber seat.*



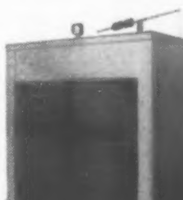
7-87—Correcto *vitreous china urinal with extended shields, integral strainer and integral trap. Fitted with* Crown *C. P. flush valve. Can be installed in batteries with one vitreous china tank set to flush simultaneously at intervals of from one to sixty minutes. Overall width 18".*



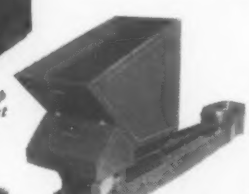
2-709 — Shower Cabinets — white baked enamel bonderized steel walls and slip-proof precast receptor. Crestmont *shower with* Dial-ese *Controls, soap dish, curtain rod and curtain. Size 32 x 32 x 76".*

Everything for the Heating System

The complete line of Crane heating equipment includes boilers, radiators, controls, specialties, pipe, valves and fittings—everything necessary for every type of heating system in schools and universities.

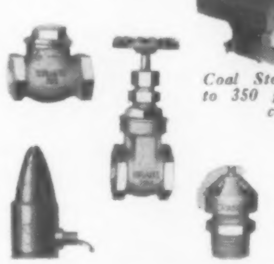


Sectional Boilers, up to 1,560,000 Btu. net capacity.



Coal Stokers, from 60 to 350 pounds-per-hour capacity.

Compac Radiators. Slim tube—3 to 6 tubes. Height 19 to 32".

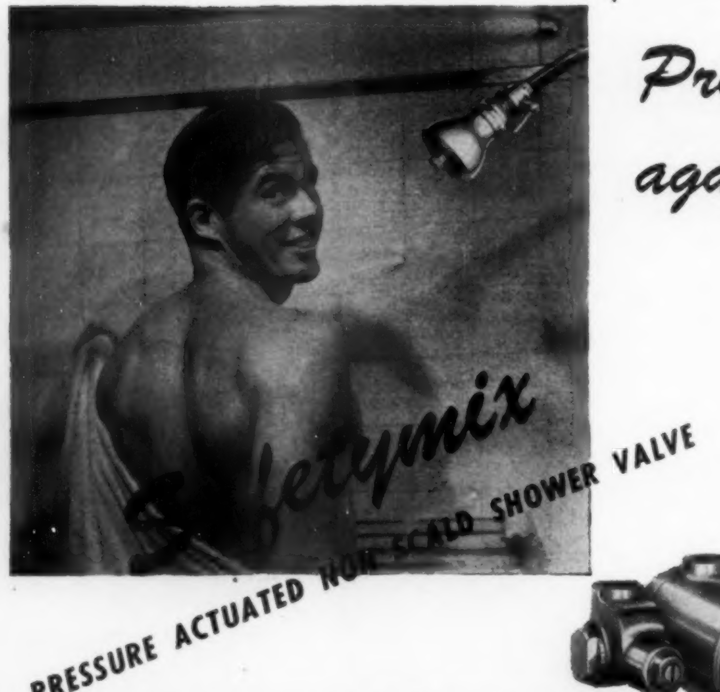


Specialties: Boiler feeders, low-pressure pop safety valves, radiator venting valves, and all necessary specialties for every heating system.

C9062 — Corwith *vitreous china drinking fountain. Sanitary angle stream jet with vandal-proof base. Automatic stream regulator.*

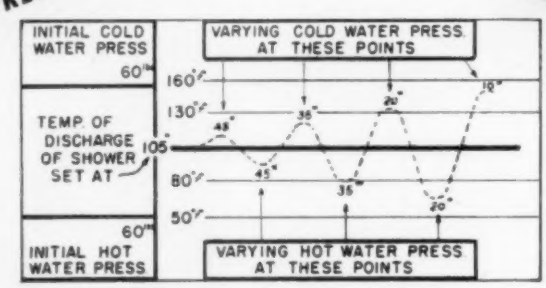
SYMMONS ENGINEERING COMPANY

791 Tremont Street, Boston, Massachusetts



Protect Students against Shower Scalds

Educational institutions throughout the country, upon careful examination, have added the Symmons SAFETYMIX non scald shower valve to their plant equipment. Not alone have students and physical directors approved this measure, but administrators have found it a desirable expenditure.



To Superintendents of Maintenance:—

This chart shows (indicated by heavy black line) the results of the effectiveness, by the use of Symmons SAFETYMIX non scald shower valve against that (indicated by the dotted line) of a two valve shower unit or ordinary mixing valve.

SAFETYMIX is now available in complete packaged units as illustrated below.

The actual cause of sudden "scalds" in showers is not fluctuations of temperature in the water feeds, but fluctuations in the *pressures.*

Therefore a shower valve that nullifies these pressure fluctuations eliminates this scald condition.

Symmons SAFETYMIX does just that. It is the only non scald shower valve guaranteed to maintain the discharge temperature within 2° F. against pressure fluctuations up to 85% in either hot or cold supply.

It costs no more than ordinary valves.

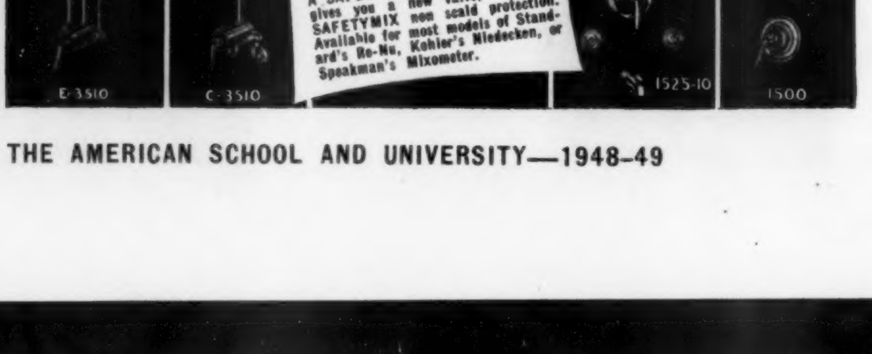
It is simple to install. It is "as easy to fix as a faucet."

Symmons

SAFETYMIX

pressure actuated non scald shower valve is in use at:—

Michigan State College
Mass. Institute of Technology
Dartmouth College
University of Cincinnati
Johns Hopkins University
State Teacher's College
Wellesley College
University of Chicago
University of Maine
Brown University
Connecticut College
College of the Holy Cross
Leland Stanford University
Marquette University
Austin Public Schools
University of Washington
DePaul University
Western Reserve University
University of Pittsburgh
William and Mary College
Loyola University
Chateau Laurier
Canadian National Railways
Royal Canadian Airforce
Canadian Vickers
Royal Montreal Golf Club
Dominion of Canada



THE EBCO MANUFACTURING CO.

401 West Town Street, Columbus 8, Ohio

World's Largest Manufacturer of *Electric Drinking Water Coolers*

Studies show that all of us—children too—are apt to feel tired, dull, "fagged out," when we're merely *thirsty*. Thirst-fatigue tends to slow down the ability to concentrate. That's why leading school officials and school architects insist on placing OASIS Electric Water Coolers at *many* convenient points. Teachers and students alike will then be constantly reminded to "refresh" with cool, clear, healthful water. It costs nothing extra to have the dependable low maintenance and extra convenience of OASIS Coolers—a few models of which are described in the following.

OASIS ELECTRIC WATER COOLERS

Oasis Electric Drinking Water Coolers are available in many sizes and types—the right model and a variety of accessories for properly meeting any need. Consult the Oasis Distributor in your vicinity or write direct to Ebco for recommendations on the proper equipment for your requirements.

MODEL OP-10

Model OP-10 Oasis Pressure Bubbler Cooler is the most universally accepted size for connection to city water supply and waste pipes. Fully automatic, it serves up to 120 persons per hour (capacity 10 gallons per hour). Requires floor space of only 15 by 15½ inches. Finger-tip operating bubbler of brass, chrome plated, has self-closing, pressure regulating valve. Top of durable, polished stainless steel. Cabinet made of Bonderized galvanized steel, strongly constructed and finished in opalescent brown. Storage type cooling unit. Hermetically sealed condensing unit; 115 volt, 50-60 cycle, A. C. operation.

MODEL OP-20-G

Model OP-20-G Oasis Cooler is a super-capacity model ideally suited for the school cafeteria. It is provided with two, all-brass chromium platform operated glass fillers (push back type also available) and will serve approximately 235 six-ounce glasses per hour (capacity 20 gallons per hour). Top is steel, vitreous porcelain enameled. Cabinet similar to Model OP-10. Condensing unit heavy-duty open type. Requires only 22⅝ by 20⅞ inches of floor space. Similar unit, Model OP-20-B, but provided with two dial-action bubblers, is especially suited for locations where there is extra heavy traffic over short periods such as frequently occurs between classes.

Illustration at right shows an Oasis Pressure Bubbler Cooler fitted with a 255 Wall Fountain (described lower right).

This arrangement is especially popular for primary schools, providing a bubbler fountain at the correct height for the little tots to easily get a drink. At the same time it provides facilities for the larger children and grown ups. This assembly also illustrates how wall fountains conveniently located at one or more remote points can be connected to a cooler for extending the service of Oasis properly cooled water.

BUBBLER

This 12000 bubbler valve, with its dial-action control, provides real finger-tip operation. It is all-brass, chromium plated and has self-closing pressure regulating valve. It has a roller bearing operating mechanism. The valve has no screen, is non-clogging and will not squirt or surge. It is accessible for regulating height of the bubbler stream. It is standard equipment on modern Pressure Bubbler Oasis Coolers but is available also for modernizing old style coolers.

MODEL OP-5

Model OP-5 Oasis Pressure Bubbler Cooler is similar to Model OP-10 but for locations where a fewer number of people are to be accommodated per hour. Capacity 5 gallons per hour.

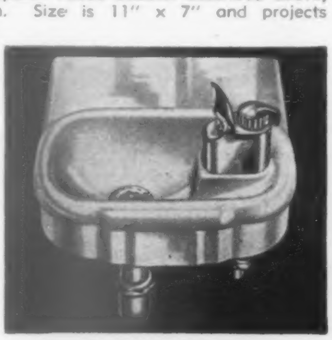
MODEL OP-10-V

Model OP-10-V Oasis Pressure Bubbler Cooler is similar to model OP-10, except it has an open type condensing unit for operation on 115 volt direct current. Same model also available for odd cycles and other voltages on special quotation.

Other Models Available for All Needs

WALL FOUNTAIN

Model V-255 Wall Fountain is a smartly designed, heavy white vitreous china fountain, fitted with the popular 12000 bubbler described above, that is suited for any location. Size is 11" x 7" and projects from the wall 11½". It is furnished with stop valve, supply line to wall, waste drain and trap. Trap size is 1¼" I.P. Inlet water connection is ⅜" I.P. This unit provides one of the most practical ways of increasing the usefulness of your modern water cooler. One or more may be connected to the cooler with ¼" copper tubing and then conveniently located at other points—even on other floors—up to a maximum distance of 20 feet. Also a splendid fountain for direct connection to city water line.



THE HALSEY W. TAYLOR CO.

Manufacturers of Drinking Fountains and Coolers

Warren, Ohio

AGENTS IN PRINCIPAL CITIES

PRODUCTS

Halsey Taylor Drinking Fountains; Combination Cooler Drinking Fountains in Iced Water or Electric Types.

DISTINCTIVE FEATURES THAT APPEAL TO ARCHITECT AND SCHOOL AUTHORITIES ALIKE

It was during the first World War that Halsey Taylor Drinking Fountains were introduced. Today, they are still accepted among the country's foremost fountains, because of their modern design, their distinctive patented features that spell convenience and sanitation alike, and their wide variety of models from which to choose. That is why they are still a preferred specification of architects and builders, whether for schools or other public buildings; industrial plants, hospitals or churches.

You buy more than a mere fountain when you buy Halsey Taylor Drinking Fountains. You buy definite assurance of trouble-free service, positive health-safety, maximum convenience, built-in patented features exclusive with Halsey Taylor!

It is in school operation that a fountain finds its greatest use as a factor in hygiene. When pupils drink from Halsey Taylor Fountains day after day, it is this assurance of health-safety that more than pays for the care in selecting the right make of fountain—and that make usually is Halsey Taylor, practically a standard in school installations the country over. Their most valued features are:

1 — Practical Automatic Stream Control

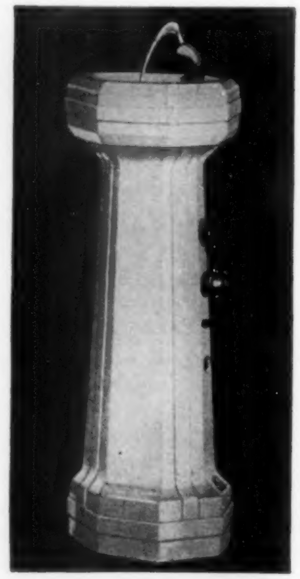
An automatic device maintains constant height in drinking stream regardless of line pressure variation. Stream never too high, never too low.

2 — Ideal Drinking Mound

The two-stream projector with latest type guard makes the side stream both practical and health-safe. removing objections found with ordinary side-streams.

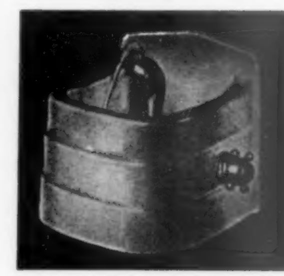
3 — Definite Sanitation

Drinking mound is formed by the converging of two streams of water, setting up a localized drinking mound which makes it impractical to drink from any other point but the ideal height of the mound. Fingers or lips cannot come in contact with or contaminate water source. It is impossible to squirt the water.



Pedestal Type—No. 3916

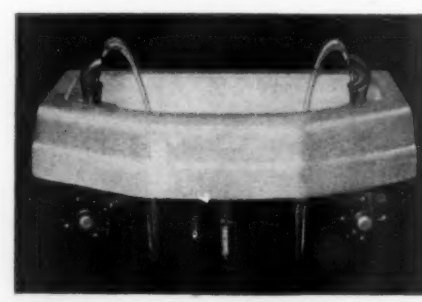
No. 3914



No. 3901

One of many attractive pedestal and wall types

Battery Types
Many two- and three-part battery types especially adapted to school installations



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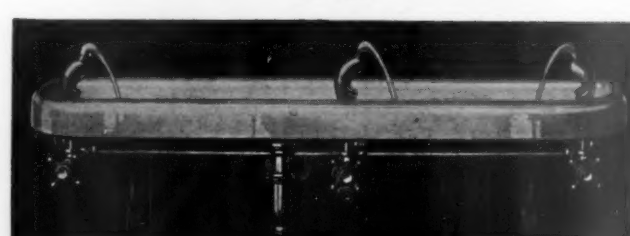


No. 2703

FOUNTAINS FOR EVERY REQUIREMENT

These pages show a few of the various types of Halsey Taylor Drinking Fountains. There are many models from which to select, all most modern in styling, all with the fundamental Taylor features. Send for catalog.

THE THOMPSON ELECTRIC COMPANY

1101–11 Power Ave., Cleveland 14, Ohio, U. S. A.

SETON HALL, EAST ORANGE, N. J.

A recent photograph of the lighting and Thompson Hanger Installation completed early in 1940. Another of the many proofs of the long life, efficiency and economy of this equipment. Inset shows a luminaire disconnected, lowered and being serviced.

Replacing burned out or dim bulbs and washing the reflectors, does not require the moving of seats, where Thompson Hangers are used. Unexpected burn outs may be quickly changed and color screens if used, may be quickly attached to the reflectors of these high positioned lighting units, by the custodian or janitor.

These are safe operations as there is no possibility of electrical shock and no need for ladders or climbing. The work is performed by the service man while working at floor level, as illustrated in the inset above.

The Holophane High-Bay units are suspended from Thompson Hangers Model L-141-G, which in turn, are suspended from the I beam roof purlins by Thompson Beam Clamp Suspensions No. 650.

The operating chains are supported by and pass through, properly spaced idler pulleys, carried to the side wall columns and down the columns to terminal lock boxes on the walls above the topmost row of seats.

An attachable handline is used for operating the Thompson Hangers and lowering and raising the lighting units.

Provide this necessary *accessibility* with,—

THOMPSON DISCONNECTING AND LOWERING **HANGERS**

—with the following advantages—

1. Lowest cost of lighting maintenance,—less than ¼ the cost of any other method.
2. Safest possible method; eliminates ladders, scaffolds, climbing and electrical hazards.
3. No waiting for maintenance crews,—relamping may be done when burn-outs occur.
4. Custodian or helper may relamp and wash fixture,—it's easy, quick and safe with "Thompson Hangers."

Thompson hangers are ideal for Assembly Halls, Auditoriums, Chapels, Field Houses, Gymnasiums, Libraries, Swimming Pools, and Outdoor Play and Sports Areas. They are suitable for many types of lighting equipment.

The Thompson Electric Company will gladly assist owners, architects, engineers and contractors with installation or specification suggestions. A complete descriptive catalog is also available for those actively interested.

Address request to Educational Buildings Department

BENJAMIN ELECTRIC MFG. CO.

General Offices: Des Plaines (Chicago Suburb), Ill.

230-234 W. 17th Street
NEW YORK

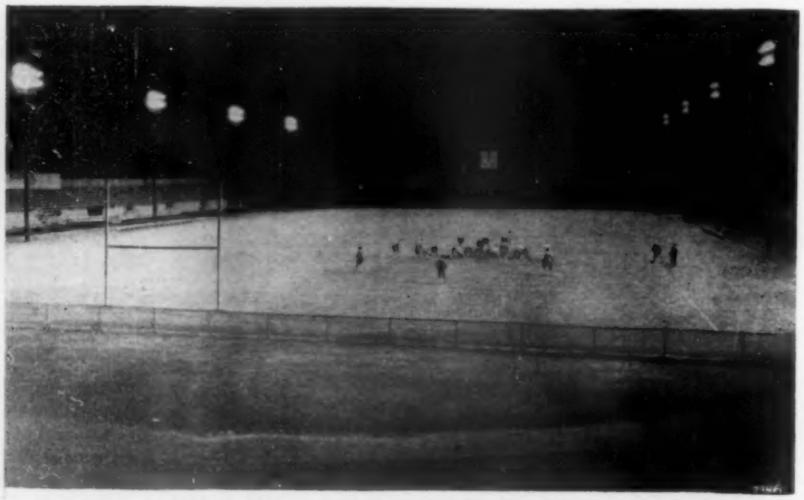
20 N. Wacker Drive
CHICAGO

448 Bryant Street
SAN FRANCISCO

FLOODLIGHTING SPORTS AREAS

HUNDREDS OF SCHOOLS throughout the country have found the answers to their problems of stimulating attendance and increasing revenue from football in Benjamin floodlighting for night games.

Night football, just like softball and other floodlighted night sports, is assured of a greater following because it takes advantage of most peoples' leisure time and offers them entertainment at a time when they are free and seeking it.

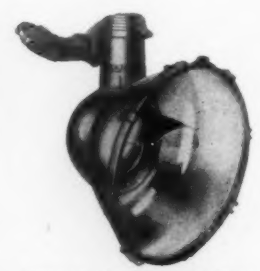


Illumination for the football field of Loyola University in New Orleans, Louisiana, is provided by Benjamin "Play-Area" floodlights using 1500 watt lamps

An installation of Benjamin Long Range "Alzo-Lite" floodlights using 1500 watt lamps at Bowman Gray Memorial Stadium, Winston-Salem, North Carolina

"PLAY-AREA"
For 750-1500 watt lamps

"ELLIPTO-LITE"
for 300-500, 750-1500 watt lamps



Long Range "ALZO-LITE"
For 750-1500 watt lamps

Medium Spread "ALZO-LITE"
For 750-1500 watt lamps

Benjamin "Play-Area" floodlights meet every requirement of football lighting by providing exceptionally high intensity illumination forward and toward the sides of the floodlighting unit. They combine in one unit a large open-type porcelain enameled steel reflector with an inner auxiliary reflector of processed oxidized aluminum which assists in building up illumination over distant areas.

Benjamin "Ellipto-Lite" floodlights are similar in general construction to "Play-Area" floodlights, but are provided with a slightly smaller porcelain enameled steel reflector. In light output they compare favorably with the "Play-Area" floodlights.

Benjamin Long-Range "Alzo-Lite" Aluminum floodlights meet the requirements for football field lighting from behind the stands when located 60 to 120 feet back from the sideline. An etched Alzak aluminum deflector redirects a portion of waste light downward to provide illumination in the stands.

Medium-Spread "Alzo-Lite" Aluminum floodlights meet the need for a unit with a light distribution between the wide spread characteristic of porcelain enamel diffusing floodlights, such as the "Play-Area" and "Ellipto-Lite," and the more concentrated distribution of the Long-Range "Alzo-Lite."

LIGHTING INTERIOR AREAS

Classrooms and Offices—The new Benjamin "Sky-Glo" luminous louver system of translucent louvers is especially adapted for use in school classrooms and offices where the visual tasks are critical and prolonged and the efficient functioning of the eye is of prime importance.

This system makes it possible to provide high footcandle levels of well diffused, comfortable, and uniform lighting throughout the entire room area.

Vocational and Engineering Buildings—Benjamin "Stream-Flo 40" fluorescent units are recommended for the lighting of classrooms and buildings devoted to engineering and vocational pursuits. They are also recommended for laboratories where no corrosive fumes, moisture or hazardous atmospheric conditions are present. "Stream-Flo 40" fluorescent units are ruggedly constructed for long dependable service, with housings of heavy gauge steel and closed-end porcelain enameled steel reflectors.

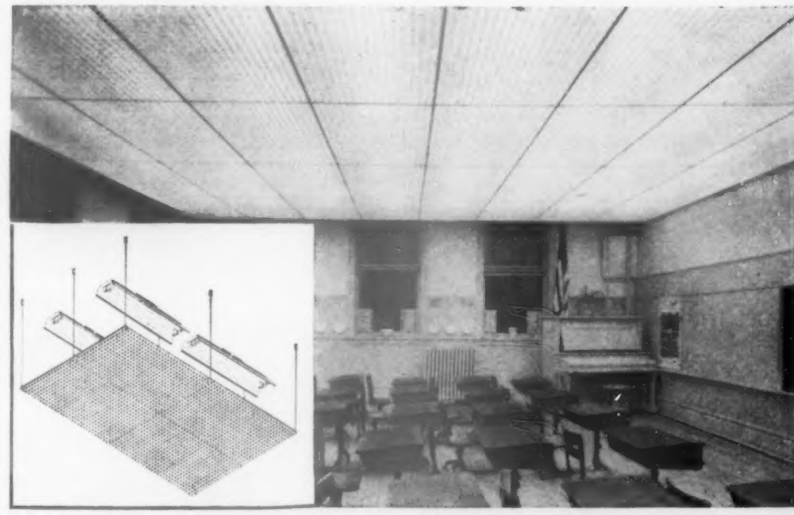
Laboratories—For laboratories where explosive hazards are present, a complete line of incandescent Explosion Proof and Dust Tight equipment is available; where moisture and non-combustible fumes are prevalent, "Vapolet" units meet the requirements.

Gymnasiums—Soft evenly diffused illumination through a wide range of intensities is provided by Benjamin Glassteel Diffusers. They are recommended for effective, glareless illumination of gymnasiums, basketball courts, handball courts, etc.

Library Stacks and Store Rooms—For lighting book stacks in the library or shelves and bins in the store room, the "Stock-Bin-Lite" is recommended. The "Stock-Bin-Lite" provides uniform illumination from top to bottom of shelves.

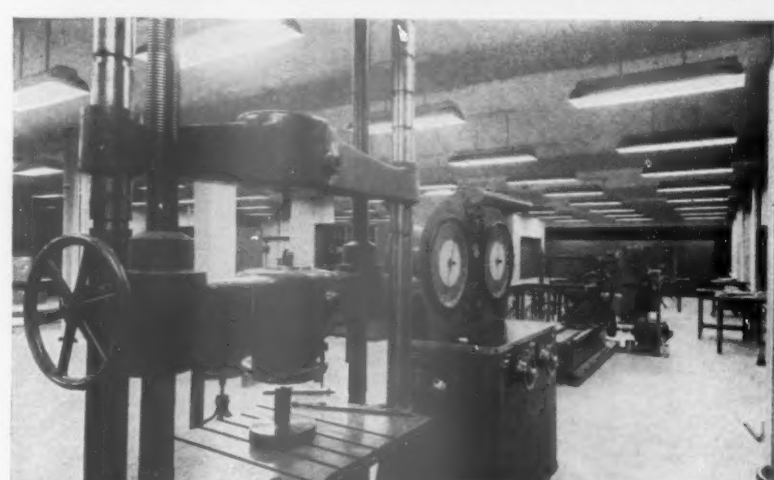
The services of Benjamin lighting specialists are available for recommendations on improvement of existing lighting, as well as for recommendations on new lighting.

Write for information on your specific lighting problem



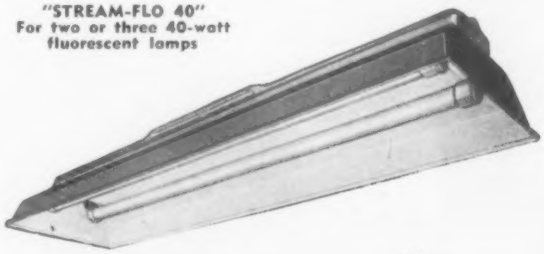
Grade Classroom at Central School, Des Plaines, Illinois, lighted with Benjamin "Sky-Glo" Louver System installed below Benjamin fluorescent units using 40-watt lamps

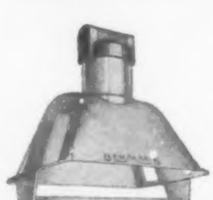
General Chemistry Laboratory of Northwestern Technological Institute, Evanston, Illinois, effectively lighted by "Stream-Flo 40" units using two 40-watt fluorescent lamps



Illumination for Materials Testing Laboratory at Northwestern Technological Institute, Evanston, Illinois, provided by "Stream-Flo 40" units for two 40 watt fluorescent lamps

"STREAM-FLO 40"
For two or three 40-watt fluorescent lamps





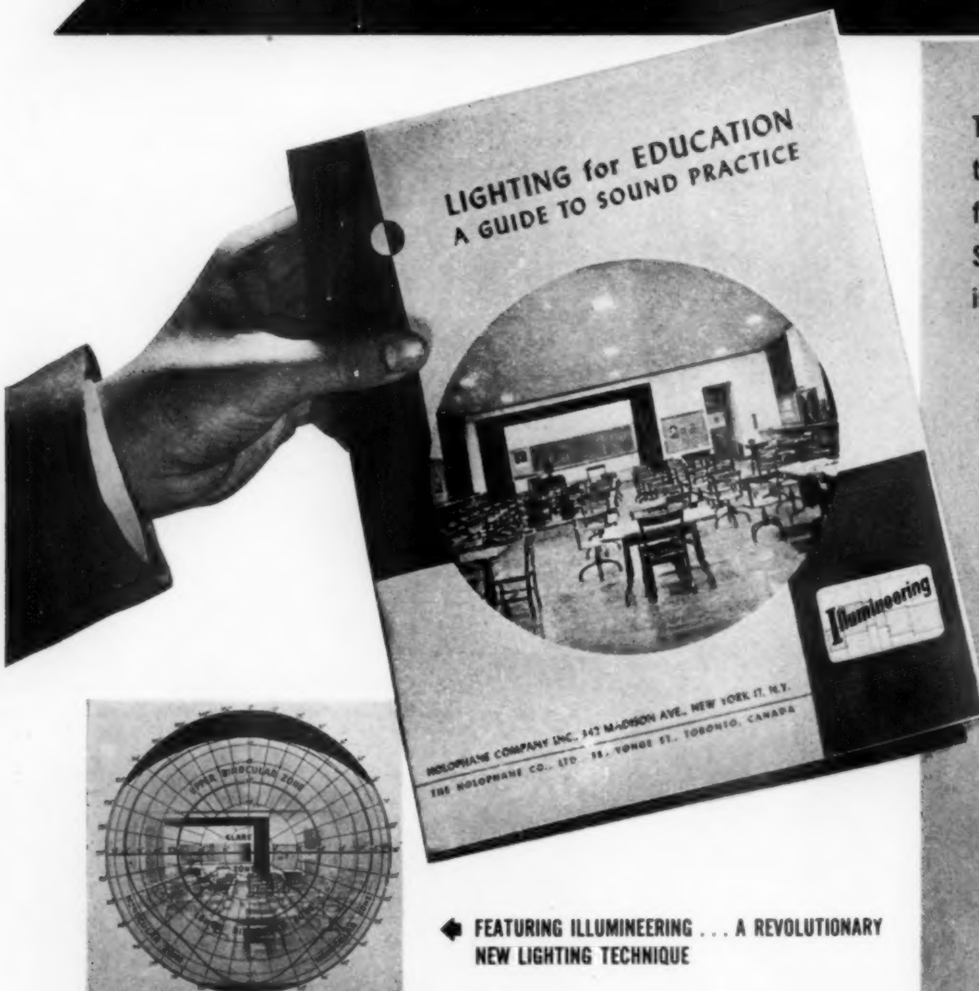
"STOCK-BIN-LITE"
For 60, 75-100, 150 watt incandescent lamps

"GLASSTEEL DIFFUSER"
For 300-500, 750-1500 watt incandescent lamps

HOLOPHANE COMPANY, INC.

342 Madison Avenue
New York 17, N. Y.

Write now for HOLOPHANE'S ANALYSIS OF SCHOOL LIGHTING



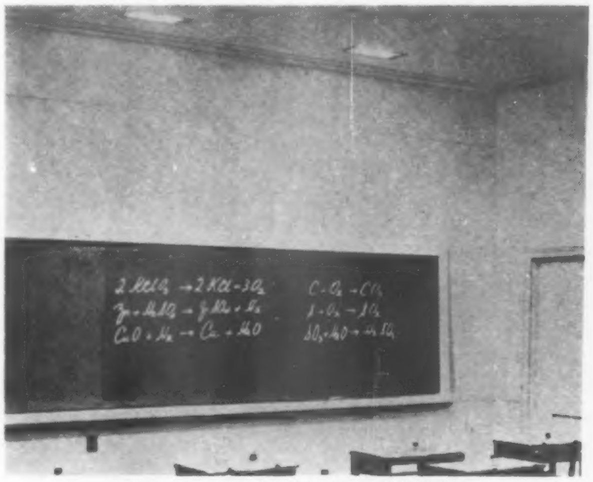
This Book Provides the newest methods for any phase of School Lighting including:

Classrooms,
Drafting Rooms,
Art Rooms,
Blackboards,
Auditoriums,
Study Halls,
Lecture Rooms,
Reading Rooms,
Library Stacks,
Laboratories,
Shops,
Dining Rooms,
Kitchens,
Cafeterias,
Traffic Areas,
Medical Rooms,
General Offices,
Gymnasiums,
Outdoor Areas

◆ FEATURING ILLUMINEERING . . . A REVOLUTIONARY NEW LIGHTING TECHNIQUE

MAKE PLANS NOW to bring the lighting in your school up-to-date . . . Your overall building expansion program may be set for some future date. Yet, you can take immediate measures to improve conditions in your present location by advancing the efficiency of your lighting equipment. For more than two generations, Holophane engineers have been recognized as authorities in school lighting. They present in this comprehensive book, methods of achieving effective economical lighting for every area of the modern school. This book is available without charge. Send for it immediately.

Consult Holophane Engineers About ILLUMINEERING


Classroom showing blackboard lighting

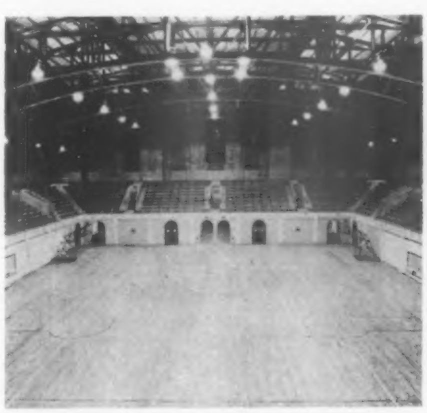

Cafeteria with Holoflux fluorescent

PLANNED LIGHTING FOR EVERY SCHOOL NEED

For every area in the school, there is a Holophane lighting unit specifically designed to provide the most adaptable illumination for the purpose.

Holophane Planned Lighting is effective, efficient, and economical. Each specific can be depended on to produce the greatest amount of useful lighting. There is no permanent depreciation of the prismatic glass light controlling surface, and temporary depreciation is at a minimum.


Classroom with luminous indirect luminaires


Gymnasium with Hibay reflectors


Lobay reflectors in shop


In-Bilt Controlenses in an auditorium

HOLOPHANE COMPANY, INC.

Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N. Y.

THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

SMITHCRAFT LIGHTING DIVISION

Chelsea 50, Massachusetts

REPRESENTATIVES THROUGHOUT THE UNITED STATES AND CANADA

Smithcraft Lighting Division, one of the leading manufacturers of both commercial and industrial fluorescent fixtures, is regarded by many school authorities as a "specialist in school lighting", although the company actually serves widespread fields. The reason for this high regard lies in the exclusive features included in the fixtures designed by Smithcraft for school use. Years of experience and intensive research have given Smithcraft engineers a thorough understanding of the problems inherent in classroom lighting and have resulted in the development of the well-known Dayliter and the new, outstanding Eye-Q . . . two fluorescent fixtures which have met enthusiastic acceptance. The information outlined on the following pages, covering the main features of these two units, is intentionally non-technical. For formal engineering and electrical data, as well as further information on these or any other fixture in the Smithcraft line, a letter to the company will bring prompt reply. Ask for the new, interesting Smithcraft School Lighting booklet, too.

Smithcraft

DAYLITER

Cat. No. D-2

2 40-watt Lamps
For Surface Mounting

Cat. No. D-21

2 40-watt Lamps
For Pendant Mounting

Dayliter, an original design by Smithcraft, provides maximum downward lighting to the "working zone" and, in addition, effectively illuminates a wide ceiling area in accordance with the highest standards of contrast control. Exceedingly shallow, this fixture has a cut-off from lamp glare of 40° crosswise and 30° lengthwise, a low surface brightness which assures comfortable, easy-on-the-eyes lighting. Dayliter is economical in initial cost, as well as maintenance and installation. Continuous rows can be formed rapidly in perfect alignment. The reflectors extend over the top of the lamps to minimize dust accumulation. For safety, the Dayliter includes no glass or plastic parts which might be subject to breakage, shrinkage, or discoloration.

MAINTENANCE IS SIMPLIFIED

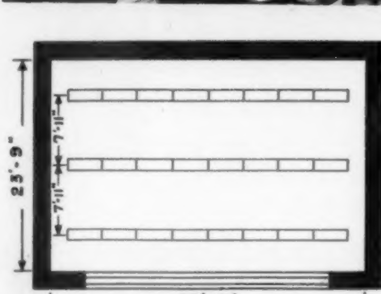
Recognizing the need for simplified maintenance in any fixture designed for schools, Smithcraft engineers went into the field to talk directly with school custodians and maintenance crews. They found that the objection most often raised concerned the difficulty in handling louvers, i.e., unsnapping locking devices, removing loose parts, etc.

As a result, Smithcraft has introduced the amazing Duo-Cam Hanger*—an exceedingly simple yet effective louver hinging development. The Duo-Cam permits the louver to hinge from either side, to be opened and closed by finger-tip pressure, and, in addition, to be completely removed at will. The louver is held securely, and the custodian is able to clean, relamp, and service the Dayliter with unusual speed and simplicity.

EXCLUSIVE LOUVER DESIGN

The Dayliter's louver pattern makes possible far better diffusion and lower surface brightness than any other unit with comparable direct light output. The cut-off from lamp glare is exceptional—40° crosswise and 30° lengthwise.

* Patent Pending.



LIGHTING SPECIFICATIONS

Three continuous rows of Smithcraft Dayliters;

Eight fixtures per row;

Mounting height 10' 0";

Ceiling height 11' 4";

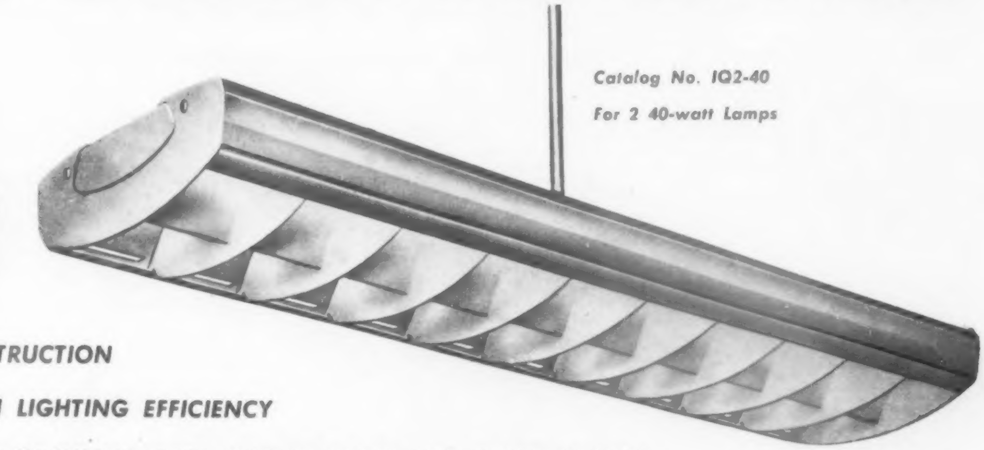
Initial foot candles 51-68, average foot candles in use, 48-63.

The unretouched photograph above shows a Smithcraft Dayliter installation in Room 304 of Mirror Lake Junior High School, St. Petersburgh, Florida. The lack of bothersome contrast between fixtures and ceiling is noteworthy in this installation and is typical of well-planned use of the Dayliter. The lighting layout and specifications are outlined directly above.

AN OUTSTANDING NEW DEVELOPMENT IN LIGHTING DESIGN FOR SCHOOLS

Smithcraft

EYE-Q



Catalog No. IQ2-40

For 2 40-watt Lamps

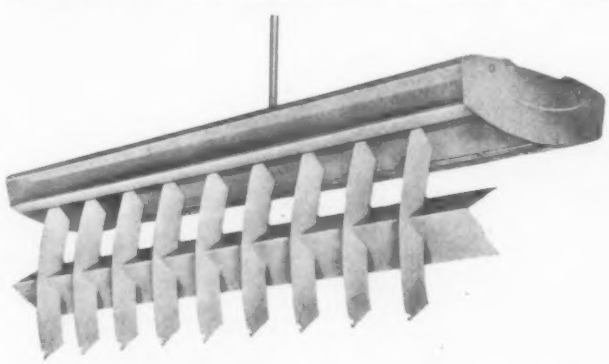
STURDY ALL-STEEL CONSTRUCTION

EXCEPTIONALLY HIGH IN LIGHTING EFFICIENCY

EXTREMELY ECONOMICAL IN INITIAL COST, INSTALLATION AND MAINTENANCE

Eye-Q is an example of Smithcraft's ability to solve inherent lighting problems in specialized fields. This unit was developed to meet the two most important needs in school lighting applications: 1) economy of initial cost, installation and maintenance; and 2) efficient, glare-free light directed to the working zone, plus adequate general illumination to control contrast. Eye-Q, a truly outstanding new development in lighting design, has surpassed normal requirements. Unusually high in efficiency (83%), Eye-Q is simple to install, easy to maintain, and extremely low in initial cost.

EXCLUSIVE FEATURES ASSURE LOW MAINTENANCE COST



The exclusive louver hinging device is another step forward in the simplifying of maintenance. No screws, no springs, no loose parts—yet the louver hinges easily from either side, closes securely, and can be completely removed from the fixture in a few seconds. The side reflectors can be quickly and easily swiveled upward, another exclusive Smithcraft feature which permits the custodian to clean the inner reflectors from the outside and without removing the lamps.

The Adjustable Guaranteed Ballast is a feature of prime importance, for it enables the installing electrician to utilize existing outlets and permits any pendant-mounting arrangement that may be desired.

NEW LO-BRITE LOUVER FINISH

The new Lo-Brite louver finish is another example of Smithcraft's attention to the demands of school lighting. Despite the fact that Eye-Q directs more light output into the working zone, the surface brightness of the unit is still amazingly low. Cool, comfortable illumination is a feature of Eye-Q, and the Lo-Brite louver finish is a prime factor in this important contrast control.

COMPLETE PENDANT MOUNTING FLEXIBILITY

Eye-Q can be mounted with hanger stems at any point along the entire 4-foot channel of the fixture. This means that any type and arrangement of stems can be employed and that existing outlets can be utilized where desired. Continuous rows can be formed quickly and easily, with a full wireway between fixtures for the convenience of the installing electrician . . . a direct savings in installation time and cost. Single or double stem sets may be used, with a variety of mounting arrangements to choose from.

CONTRAST CONTROL

The superiority of Eye-Q goes further than installation and maintenance features. The control of contrast, the elimination of dark spots and points of glare, is an important advancement in this Smithcraft fixture. The sides are evenly illuminated, the overhead lighting has no "hot spot," and the louver cut-off from lamp glare is excellent (35° crosswise, 25° lengthwise). There are no glass or plastic parts to break, shrink, or discolor. With universal recognition of the need for contrast control, the Eye-Q has proved itself the outstanding fixture for school lighting.

SMITHCRAFT ADVISORY SERVICE

The main headquarters of Smithcraft Lighting Division in Chelsea, Mass., is staffed with an experienced design and engineering department, whose services are offered to school planning boards, architects, lighting engineers, contractors and other interested groups. Representatives throughout the United States and Canada will be glad to discuss any lighting problems with you. Please use our facilities whenever we can be of any help whatsoever. Communications to our office will be given prompt attention.

In addition, Smithcraft Lighting Division will be pleased to send, on request, complete literature and prices on all fixtures in the diversified Smithcraft line. The new Smithcraft School Lighting Booklet will be of particular interest, as it contains valuable information on this important lighting application. Send for it now. No charge or obligation, of course.

SMITHCRAFT LIGHTING DIVISION
Chelsea 50, Mass.

THE EDWIN F. GUTH COMPANY

2615 Washington Avenue St. Louis 3, Missouri

Guth FLUORESCENT AND INCANDESCENT LIGHTING

A GUTH LUMINAIRE FOR EVERY SCHOOL LIGHTING NEED!

FUTURLITERS in the Griswold School, Jackson, Michigan, provide 66 F. C. of quality, uniform illumination. Save sight for coming generations

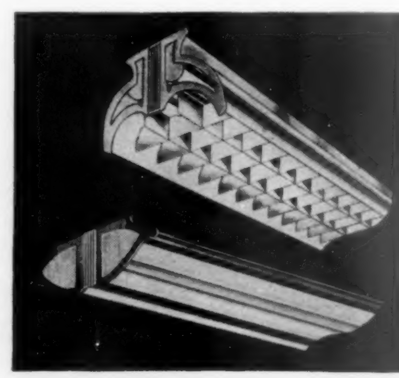
In the GUTH Line you will find the lighting Equipment to meet your *every* lighting requirement. Since 1902, GUTH has developed and pioneered specialized fixtures to provide the high quality lighting that's so necessary for efficient, comfortable seeing in the school room. The GUTH Line is a complete line of finely engineered lighting equipment for Fluorescent and Incandescent light sources, to meet all your lighting needs from small utility type fixtures to artful entrance standards.

GUTH Lighting Equipment is designed from a practical as well as scientific standpoint. GUTH Luminaires are designed to provide maximum lighting efficiency, dependable service and low cost, economical maintenance.

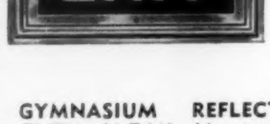
GUTH ZEPHYR

FLUORESCENTS — GUTH Fluorescent Luminaires for schools are available in various types including glass diffusing, lamp shielding (Eggcrate types), totally indirect, Troffers and exposed lamp types. Engineered GUTH Fluorescent Lighting Systems economically provide easy seeing illumination at desk level. Write us for data.

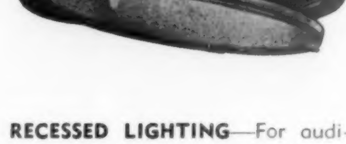
INCANDESCENTS—GUTH Indirect Lighting provides complete concealment of light source. Illumination at desk level is uniform, shadowless and glareless. GUTH Indirect Luminaires are offered in various designs with efficient, *Permanent* ALZAK Aluminum Reflectors. GUTH Incandescents are also provided in Direct, Indirect, and Semi-Indirect types. Write us for data.



FUTURLITER AND TRUCOLITE



EXIT and Directional Signs are available in practically unlimited variety of styles, wordings and mountings. Write for GUTH EXIT Catalog No. 833.



GYMNASIUM REFLECTORS — GUTH ALZAK Aluminum High-Bays for Incandescent or Mercury Vapor Lamps are available in three Reflector types.

RECESSED LIGHTING—For auditorium, hall or classroom; Incandescent or Fluorescent lamps.

WRITE FOR GUTH CATALOG TODAY

Leaders In Lighting Since 1902

Guth

THE F. W. WAKEFIELD BRASS COMPANY

Yearwood Park
Vermilion, Ohio

Over 40 Years in the Manufacture of Lighting Equipment

DISTRIBUTORS IN OVER 200 CITIES

Wakefield Helps Pioneer Coordinated Classroom Concept at Rosedale School

Item	Room 3 Commodores	Room 4 Stars
Ceiling	White 88%RF	White 88%RF
Walls	Ivory 75%RF	*Yellow 86.6%RF *Turquoise 66%RF
Dado	Beige 69%RF	No Dado
Trim	Ivory 76%RF	Gray 61%RF
Floor	Brown Wd. 25%RF	Brown Wd. 25%RF
Desk Tops	Nat. Birch 34-54%RF	Nat. Birch 34-54%RF
Chalkb'd.	Sierra Green 23.1%RF	Sierra Green 23.1%RF
Tackb'd.	Cork 23.1%RF	Cork 23.1%RF

*Yellow on front and rear walls, turquoise on inside wall. The color on the front wall and rear wall at the time of measurements was a temporary covering coat, with too high a reflection factor. Final coat will be approximately 80%RF.

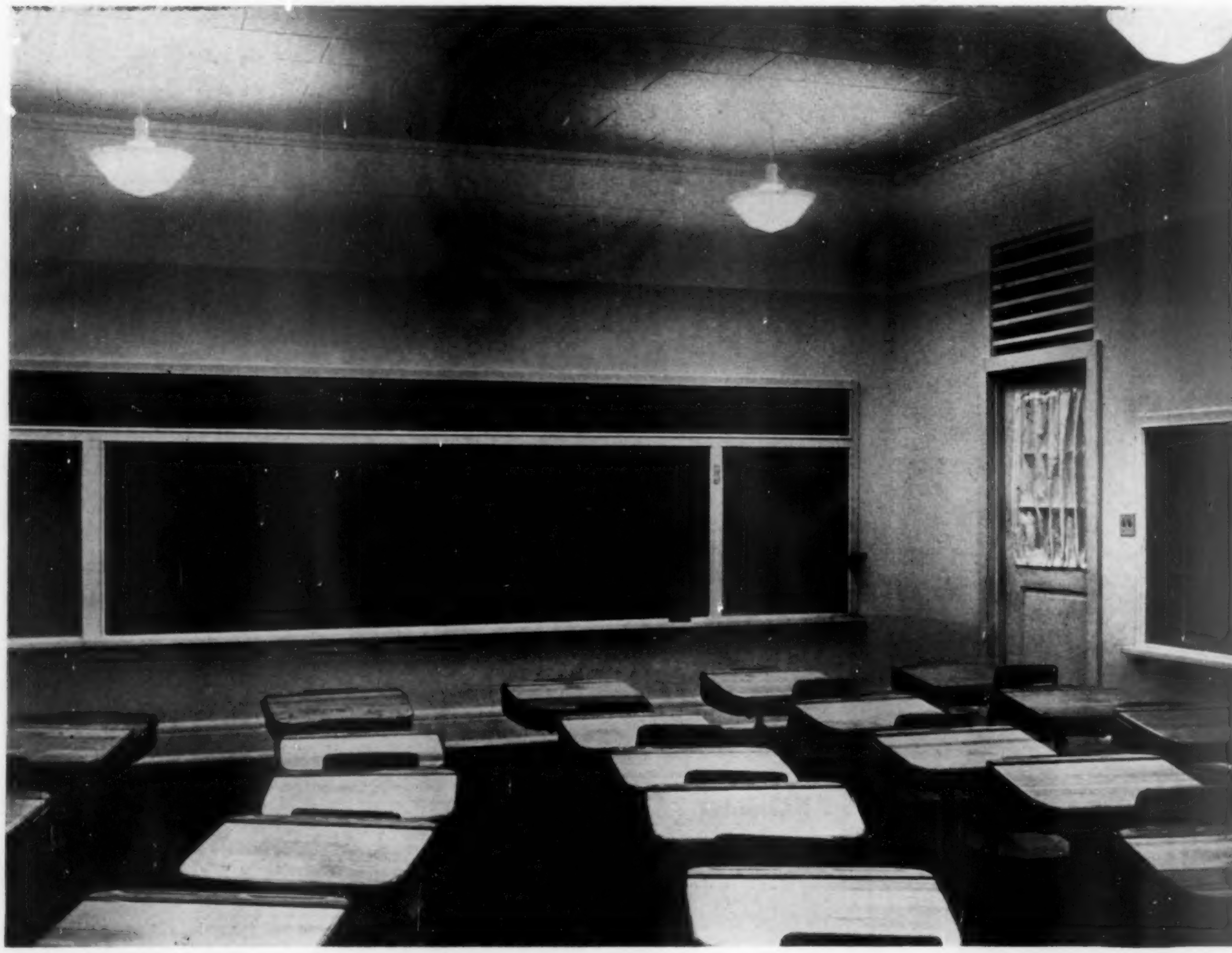
The widely heralded experimental work done at the Rosedale School in Austin, Texas, demonstrates conclusively that the coordinated classroom concept is the answer to good classroom lighting. This accords with the recommendations of the National Council on Schoolhouse Construction, which emphasize the need to "take into consideration the entire visual environment as it affects the physical, mental and emotional welfare of students."

We are proud to say that Wakefield finely engineered lighting equipment played an important role in the development of the coordinated classroom concept at Rosedale School. When the various coordinate elements were brought into balance—the color of walls, ceiling, floor and chalkboard; the design, color and angle of desks; the control of daylight—it was found that Wakefield fixtures economically and efficiently provided a quantity and a quality of illumination contributing remarkably to an environment in which seeing is relatively effortless.

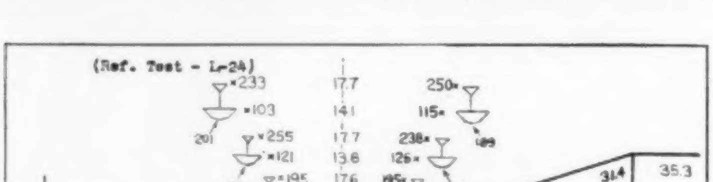
In-Service Reflection Factors, Rosedale School

The table at the left, showing paint reflectivities, is from the report, Illumination Tests of the Rosedale School, by R. L. Biesele, Jr. and W. E. Folsom, illuminating engineers, Dallas, Texas. Wakefield Commodores are in room 3 and Wakefield Stars in room 4.

(SEE OVER)



Remodeled Room 3, Rosedale School—with Wakefield Commodores



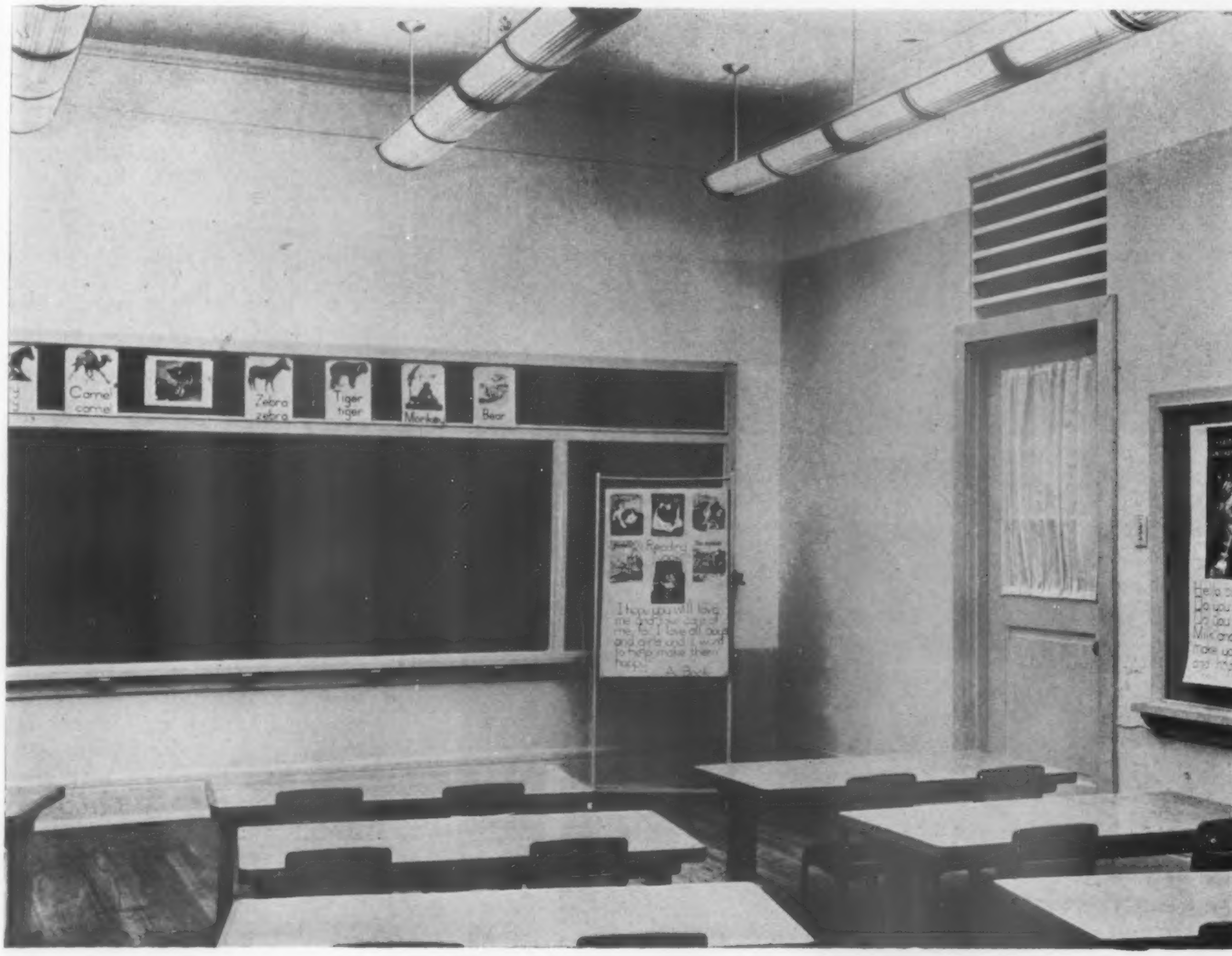
Above readings: brightness in footlamberts.

The ideal environment strives to provide the child, within his field of vision, brightness differences which are at a minimum during a particular fixation. A study of the photo above and the drawing at the left will show how nearly this result has been achieved in Room 3 at Rosedale School, where Wakefield Commodores are installed.

FIGURE 34 (left)

is from the report, Illumination Tests of the Rosedale School, by R. L. Biesele, Jr., and W. E. Folsom, illuminating engineers, Dallas, Texas.

Rosedale School, Remodeled Room 3. Brightness in footlamberts. Data obtained 12:15-1:00 a.m., July 6, 1947. Artificial light only from Wakefield "Commodore" 500 watt incandescent plastic bowl pendent luminous indirect units, after approximately 2 weeks service after maintenance.



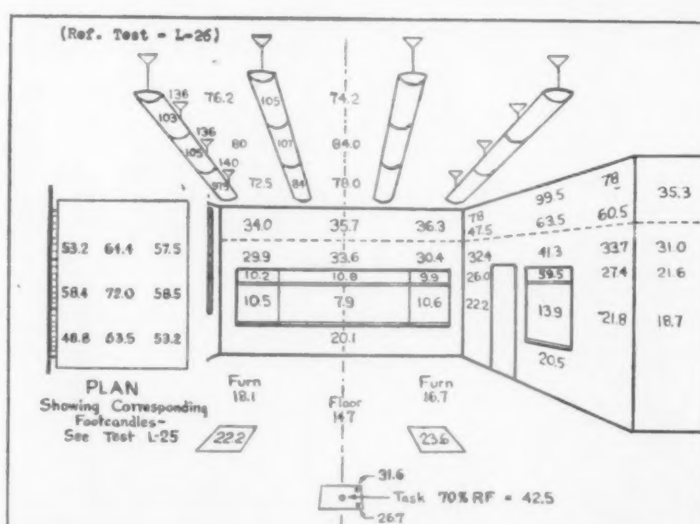
Remodeled Room 4, Rosedale School — with Wakefield Stars

As will be seen from the photo and drawing on this page, the brightness pattern for the Star installation speaks for itself. The ceiling is almost uniformly lighted and the brightness comparison with the reflector itself approaches unity. Note that the illumination tests both in this room and in room 3 were made at night.

FIGURE 35 (right)

is from the report, Illumination Tests of the Rosedale School, by R. L. Biesele, Jr., and W. E. Folsom, illuminating engineers, Dallas, Texas.

Rosedale School, Remodeled Room 4. Brightness in footlamberts. Data obtained 1:20-2:00 a.m., July 6, 1947. Artificial lighting only from Wakefield "Star" 2 lamp, 40-watt fluorescent, plastic luminous indirect units, after approximately 2 weeks service following cleaning.

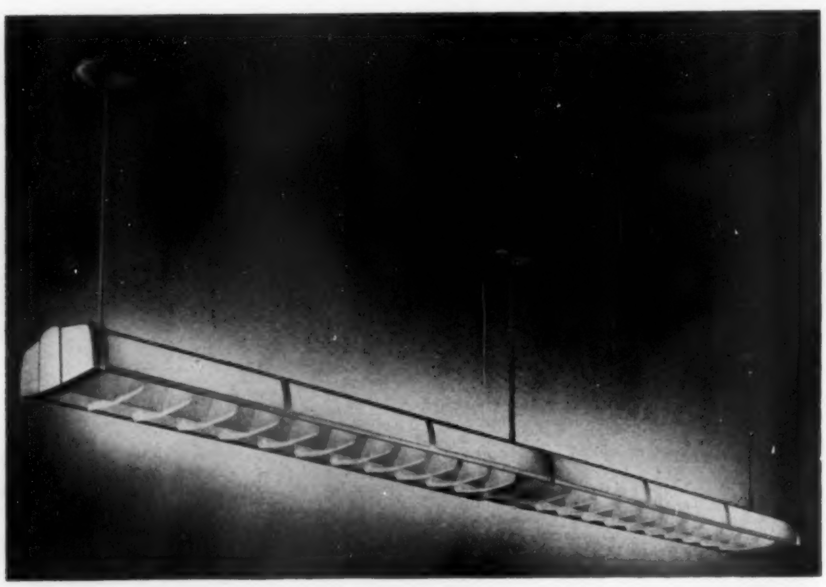


Above readings: brightness in footlamberts. (SEE OVER)

The Wakefield STAR

Used with marked success in room 4 of the Rosedale School, the STAR is a luminous indirect lighting unit with a molded translucent Plaskon reflector of such density that the lighted luminaire is of approximately the same brightness as the illuminated ceiling. Thus it provides an even distribution of light intensity all over the room, with no deep shadows or sharp contrasts and without distracting glare from the light source. Each 4′ section utilizes two 40W fluorescent lamps. (Latest development in Star design makes it available for use with four 8′ Slimline lamps.)

The Wakefield GRENADIER II



Particularly recommended for classrooms, the GRENADIER II has a specially designed louver which diffuses the light efficiently and masks the surface brightness of the lamps. Plastic side panels and optional top reflector plates permit controlling the upward and downward components of the light. There are three styles: Stem, Canopy and On-Ceiling, each utilizing two 40W fluorescent lamps per 4′ section. (Available now is the GRENADIER IV, utilizing four 40W fluorescent lamps per 4′ section, which in larger rooms gives an excellent lighting result with a minimum of units.)

The Wakefield COMMODORE

This luminous semi-indirect incandescent luminaire, used in room 3 of the Rosedale School, is manufactured in a complete series for wattages from 200W to 1000W. The molded white Plaskon reflectors vary in wall thickness to insure uniformity of brightness for the various lamp sizes. The hangers are made of aluminum, and finished in satin aluminum. (Shown at right.)

For information and assistance on your classroom lighting problems please write to The F. W. Wakefield Brass Company, Vermilion, Ohio.

Wakefield — WAKEFIELD W — **Over-ALL Lighting**

A BASIC CLASSROOM TOOL

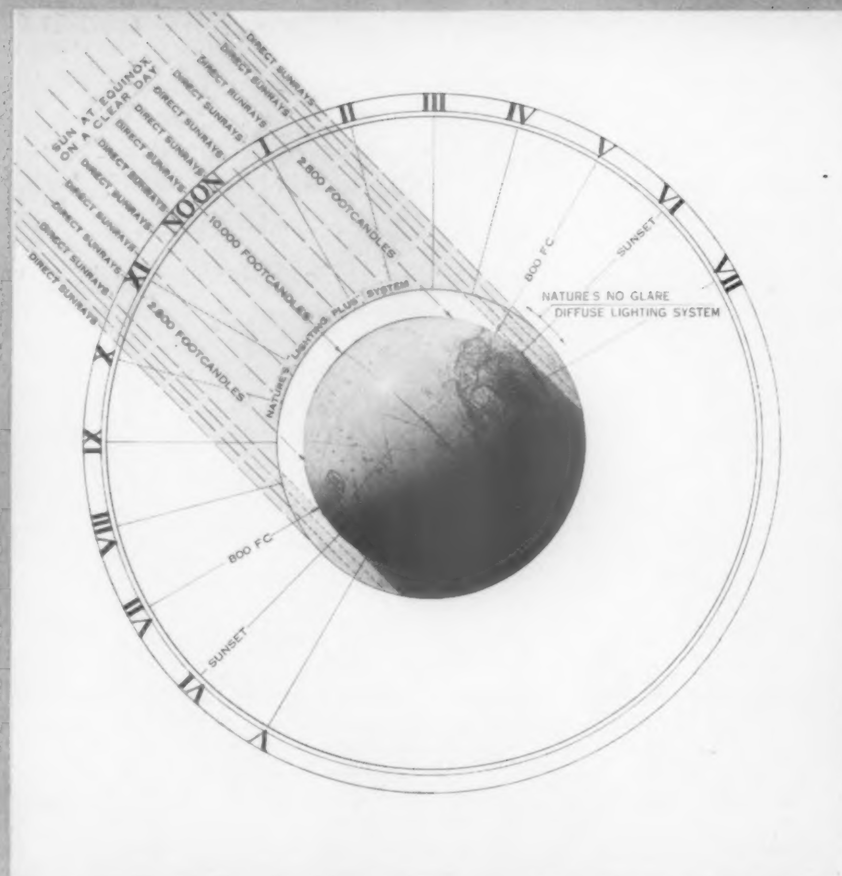
GOOD ARTIFICIAL LIGHTING IS FREE FROM SHARP SHADOW

AINSWORTH LIGHTING INC.

NATURE Supplies the clue for LIGHTING

Vision evolved under nature's lighting to see well at all levels of daylight. This is axiomatic. To duplicate the sunlight levels, (10,000 footcandles down to 250 footcandles), artificial lighting is too expensive.

However, indoors we can simulate 30 to 125 footcandles, if desired, and the miracle of retinal adaptation makes sensitivity quite constant. This agreeable sunless light is shown in the diagram, as the sun's rays pass horizontally across the heavens, and causes the atmosphere to diffuse all the light from the entire overhead. Ainsworth SPACIALITE* reproduces this desirable quality at prudent expense. It is beautiful, shadowless, diffuse light; in fact, the only quality that the eye ever knew at levels which can be simulated. We call this SPATIAL BRIGHTNESS EQUILIBRIUM. The sensitivity of the eye is increased. Axiom: when a shadow is cast there is a bright source in the overhead that violates the equilibrium.



Many responsible citizens, school boards and parent teacher's associations carry a considerable public burden in properly balancing merit against the cost of sight-saving illumination. Appropriations are fixed by law. Budgets are not flexible. President Conant, of Harvard, has emphasized that discrimination among values and making relative judgments, is an attribute of competent citizenship, but how can a citizen appraise the cost relation of lighting to vision? How discriminate between a biological science as complex as vision, and commercial "bunkum?" They cannot easily do this. However, a criterion can be set up.

We all know that when the sun is obscured, vision is not blurred while reading and writing outdoors. The eye evolved to see clearly under nature's lighting system. In fact, the sensitivity of the eye automatically adapts itself to any moderate level. Moderate levels of artificial light within prudent expense result when the brightness of the fixtures exactly equals the brightness of the ceiling. All the overhead, both fixtures and ceiling, must approach the same brightness. This equilibrium is the crux of the new interflection technic that prevents blurring of vision. Skill can make the quantity of this kind of light, conform to the budget. After sunset, lighting commences to be insufficient for studying. It is axiomatic that artificial lighting should simulate the desirable condition of DAYLIGHT.

A simulation of totally diffuse natural lighting helps the children to do well at their lessons. They enjoy studying in cheerful, light classrooms or libraries. Absence of glare and consequent shadow avoid discouragement and frustration to the handicapped, to the children who should wear glasses. A dark surrounding is particularly inimicable to vision; consequently we must avoid the wood panelled interiors of Collegiate Gothic style of the candle flame era.

Dark walls and blackboards, cause lights to look glaring and much light can be lost by unnecessary absorption. Consequently the ceilings and upper walls should be plain white, to utilize the maximum interflection of light units (lumens) see figures 1 and 2. Vision is clear when we obey the law of spatial brightness equilibrium at prudent levels.

AINSWORTH LIGHTING, INC. 3810 TWENTY-NINTH STREET LONG ISLAND CITY 1, N. Y.

*Trade Mark Reg. U. S. Pat. Off.

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FOR THE HIGHER LEVELS OF ILLUMINATION

AINSWORTH LIGHTING INC.

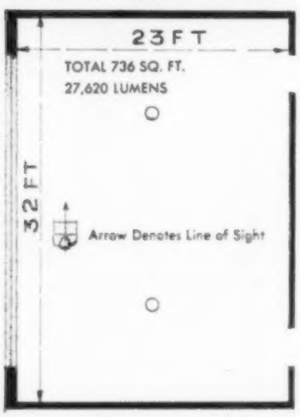
INCANDESCENT LIGHTING WITH THE AINSWORTH MAGNA LUMINAIRE

U. S. PATENT 1,957,192 CANADIAN PATENT 348,747

Dr. Matthew Luckiesh of the General Electric Lighting Research Laboratory has pointed out that "for higher levels of illumination, the footcandle not only becomes inadequate as a measure of effectiveness of lighting, but eventually a prominent use of it will handicap lighting progress." The adequate measure of effectiveness is the faintness of shadow caused by the AINSWORTH technic of brightness equilibrium.

GRADED STEPS TOWARD GOOD LIGHTING ⟶

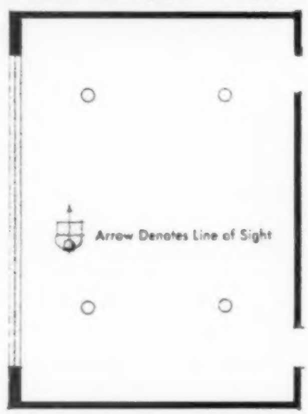
ROOM 1 $60 2000 w



2 1000 w LAMPS

Room 1—1000 w Luminaires 16′ 0″ apart cause bright circles that shock the eyes, vision is poor and fatiguing, a reflex retaliates by dulling the sensitivity of the eye.

ROOM 2 $60 2000 w

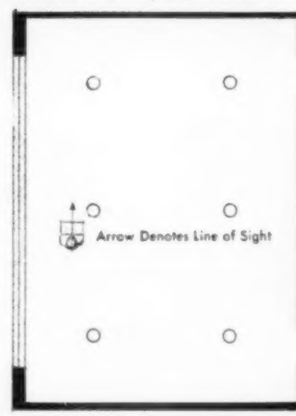


4 500 w LAMPS

Room 2—The quantity of lumens and cost is same as in Room 1. Nevertheless four glaring areas on the ceiling is shockingly bad lighting, now prevalent in schools.

U S PAT PEND

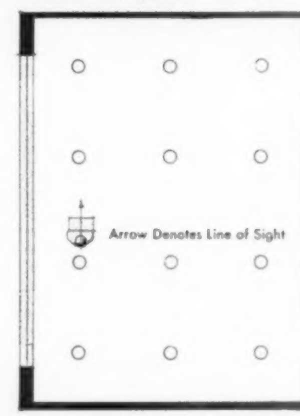
ROOM 3 $90 1800 w



6 300 w LAMPS

Room 3—This six fixture scheme shows the first modern step by spreading light evenly over the ceiling to reduce shock. It lead to a discovery and patent.

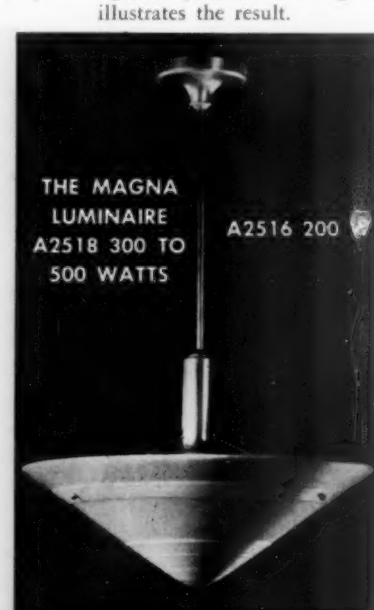
ROOM 4 $132 2400 w



12 200 w LAMPS

Room 4—This Helios Equilibrium results from several low wattage fixtures closely spaced. It tends to simulate diffuse daylight at prudent cost. Fig. 1 illustrates the result.

Fig. 1



It will help to review the financial facts that underlie the selection of lighting fixtures relative to the budget. From long experience of a most competent general contractor on multi-story buildings, it is known that the average cost in 1939 of fireproof school buildings was 55/75¢ and for semi-fireproof schools 36/45¢ per cubic foot.

Budgets must be met. The ratio of cost, of foundations, of steel, masonry, plastering, painting, plumbing and electric lighting must conform closely to an exact percentage of total cost. This is axiomatic. Careful analysis of 38 buildings shows that electric wiring, fixtures and their installation, average 5.45% of the total appropriation. When we consider the

42 YEARS EXPERIENCE IN LIGHTING DESIGN GIVES YOU THE BEST AT COST WITHIN YOUR BUDGET

FOR THE HIGHEST LEVELS OF ILLUMINATION

AINSWORTH LIGHTING INC.

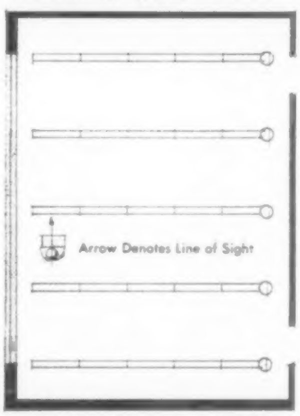
FLUORESCENT LIGHTING WITH THE AINSWORTH SPACIALITE

U. S. PATENT 2,346,717 CANADIAN PATENT 428,313

Drs. Ferree and Rand of the Research Laboratory of Physiological Optics of Johns Hopkins said: "Only light diffusely reflected can form an image of the work on the retina." The new Ainsworth SPACIALITE will provide the most comfortable high level diffuse illumination. It conforms to the ideals set by competent scientists.

GRADED STEPS TOWARD SUPERB LIGHTING ⟶

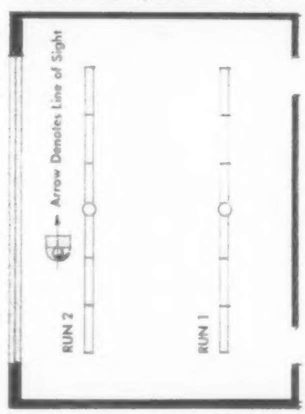
ROOM 5 $625 2500 w



50 40 w F LAMPS

Room 5—NEVER annoy the eyes by crossing the line of vision with bright stripes of reflectors. The eye cannot compensate for such VIOLENCE.

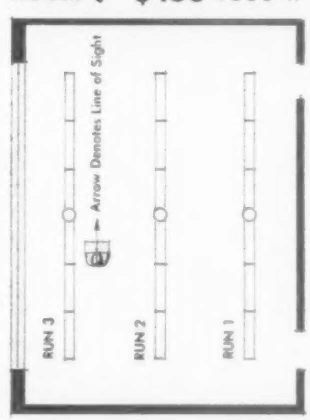
ROOM 6 $300 1200 w



24 40 w F LAMPS

Room 6—As daylight begins to fail we light run 1 to equalize the illumination. Thus runs parallel to window wall is a more advantageous design.

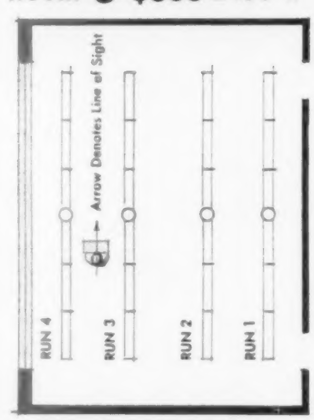
ROOM 7 $450 1800 w



36 40 w F LAMPS

Room 7—Three runs provide really perfect lighting at 2.43 w per sq. foot of ceiling. With SPACIALITE specifications, we achieve the STANDARD OF ADEQUACY.

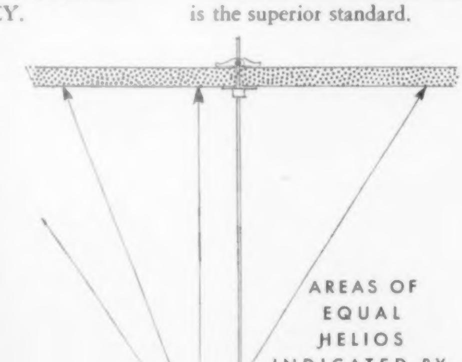
ROOM 8 $600 2400 w



48 40 w F LAMPS

Room 8—*The famous Poughkeepsie SIGHT-SAVING CLASS ROOM.* About 3.5 w per sq. ft. of ceiling provides shadowless illumination. This is the superior standard.

Fig. 2



SECTION OF SPACIALITE REFLECTOR

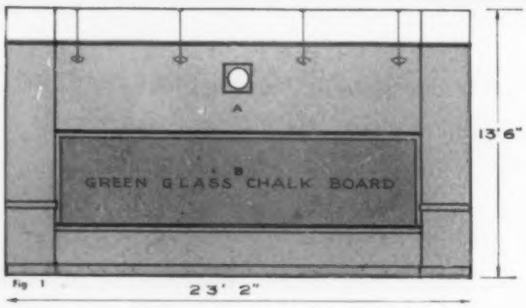
one story modern school on the basis of floor area, we find the cost is about $15.00 per square foot. Therefore, to be within the aforesaid budget of 5.45%, the wiring and lighting together should cost $0.8175 per square foot. Corridors, toilets and service cost as low as $0.15 per square foot. According to the proportion of service space to class room space, we therefore, can increase the allotment for critical lighting to about $0.70 per square foot. This amount is just sufficient to achieve excellent visual condition by the brightness equilibrium system. This is the contribution of modern science to the comfort, health and well-being of the student and gratification of the teacher.

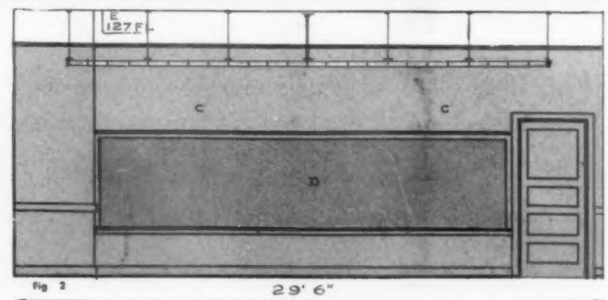
THE ABOVE COSTS INCLUDE AINSWORTH'S PROFESSIONAL SERVICE AND GUARANTEE

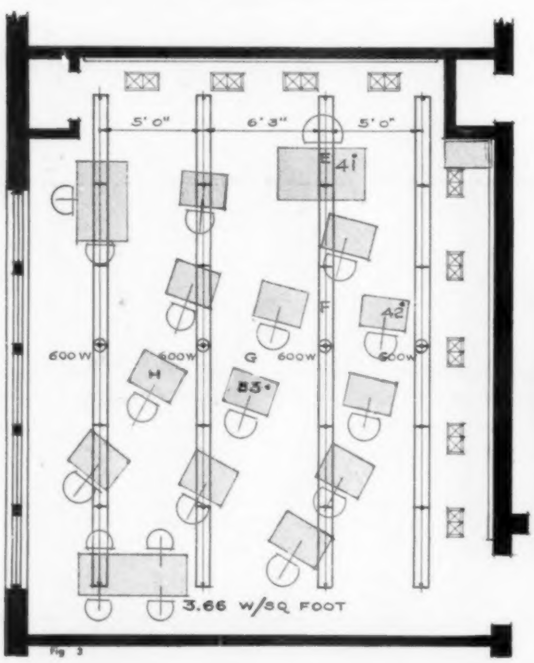
AINSWORTH LIGHTING, INC. 3810 TWENTY-NINTH STREET, LONG ISLAND CITY 1, N. Y.

SPACIAL LIGHTING FOR SIGHT-SAVING CLASSROOMS

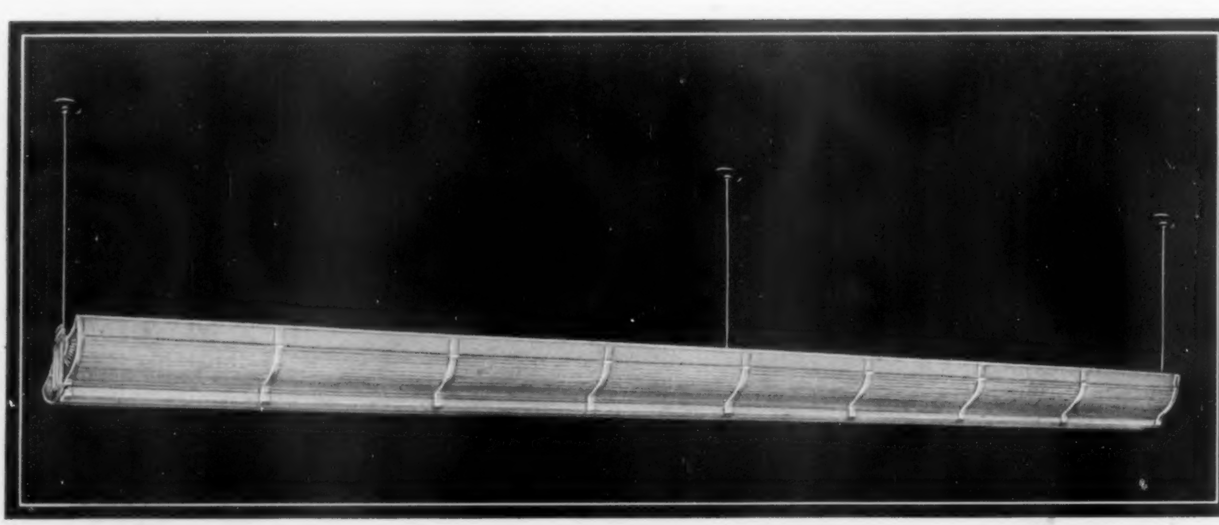
AINSWORTH LIGHTING INC.







AINSWORTH SPACIAL LIGHTING IN THE FAMOUS POUGHKEEPSIE SCHOOL PROJECT



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THIS handsome booklet of 48 pages contains more than 150 designs, both standard and custom. You will find helpful suggestions for every kind of school requirement. Write for Catalog A — it will be mailed promptly without charge or obligation.

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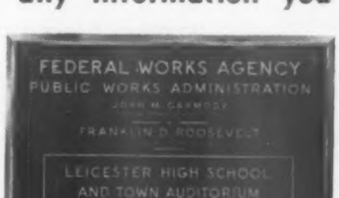
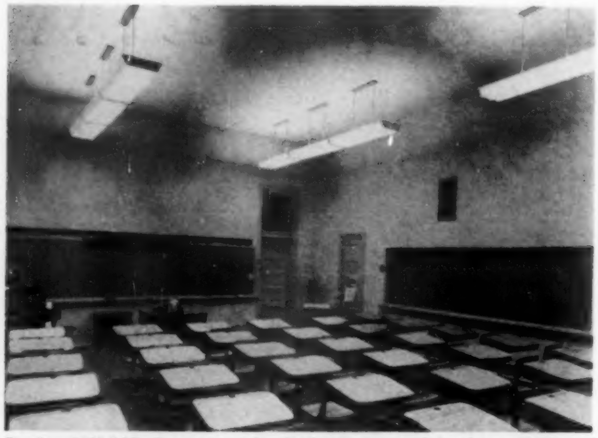


WESTINGHOUSE ELECTRIC CORPORATION

Plants in 25 Cities — Offices Everywhere

LIGHTING DIVISION — EDGEWATER PARK — CLEVELAND, OHIO



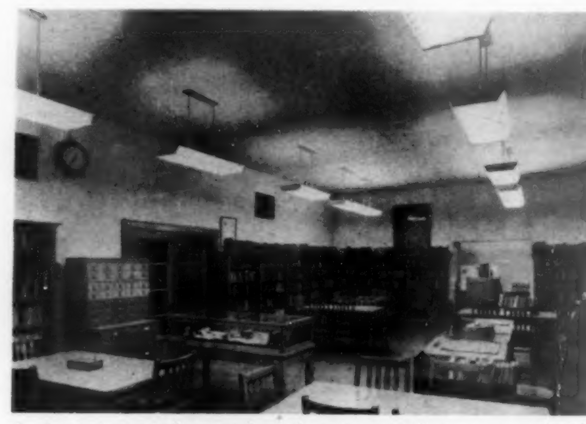
Twelve LW-160 fluorescent luminaires arranged in four groups of three units provide excellent illumination in this classroom where visual conditions are further improved by light finishes on walls, ceiling, floor and desk tops. The chalkboards are medium green instead of the conventional black.

Better "See-ability" for Classrooms

Artificial lighting for classrooms and other study rooms must supplement daylight so that high level, well diffused, glareless illumination is available at any hour of the day, any month of the year. Even on bright days artificial illumination is necessary to compensate for the lack of sufficient daylight illumination on the inner rows of desks. Without artificial lighting, pupils sitting close to the windows may receive as much as 20 times more light than those sitting near the inner wall. Artificial lighting systems should be so designed that all luminaires may be employed on dark days or only the inner units need be used on bright days.

Recommendations for school lighting by Westinghouse engineers go far beyond the equipment itself. They include recommended spacing of fixtures, color of walls and ceilings, and type of finish. Contact your local Westinghouse office or write to the Lighting Division, Westinghouse Electric Corporation, Cleveland, Ohio, for experienced assistance in your modernization of new construction planning.

An installation of six 500 watt Magnalux indirect incandescent luminaires will provide a moderate amount of comfortable illumination in a classroom. Somewhat higher illumination levels may be obtained from 750 watt units where sufficient wiring capacity is available.



A pleasant atmosphere and good seeing conditions are provided by this school library installation of twelve LW-160 luminaires arranged to conform with the location of existing outlets.

FLUORESCENT

LW-160 Fluorescent Luminaires, for four 40-watt lamps, provide efficient direct-indirect lighting in classrooms, study halls, libraries and offices. Side panels can be either clear ribbed glass or metal louver. Louver bottoms are recommended to simplify maintenance.

CD-80 Fluorescent Luminaires, for two 40-watt lamps, employ translucent plastic side and bottom panel for semi-indirect lighting. Available also with metal louver bottom for direct-indirect lighting. Suggested for classrooms and school offices where either semi-indirect lighting or direct-indirect lighting from a two-lamp fixture is required.

INCANDESCENT

Magnalux Luminous Glass Basin Luminaires for 300-1000 watt filament lamps, provide soft indirect illumination in school classrooms, offices and cafeterias where incandescent light sources are desired.

Better "See-ability" for Sports Facilities

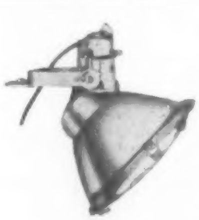
In athletic areas detailed seeing is not usually required, but players and spectators must see accurately and quickly. Proper illumination, therefore, is necessary because speed of seeing is increased by higher levels of illumination.

Gymnasium equipment must be rugged to withstand severe abuse. Anything as fragile as a lamp must be fully protected to prevent breakage. Maximum visibility of a ball must be provided high above the floor as well as close to the floor. Walls, ceiling and trusses should have a high reflection factor to give maximum illumination and provide comfortable seeing for both players and spectators.

For outdoor sports such as football, baseball, softball, or tennis, floodlighting installations must be designed to meet the type of application and physical surroundings. If areas are large, individual towers or poles spaced at regular intervals may be required to light it evenly; or adjacent buildings may be utilized as equipment locations.

Whatever your sports lighting problem, Westinghouse engineers will give practical assistance in solving them. Contact your local Westinghouse office or write to the Lighting Division, Westinghouse Electric Corporation, Cleveland, Ohio.

In gymnasium lighting it is important to provide good seeing conditions for both players and spectators. In this installation 300-500 watt Millite luminaires with wide distribution reflectors, using 500-watt PS-40 inside frosted filament lamps, were installed at a 22-foot mounting height.



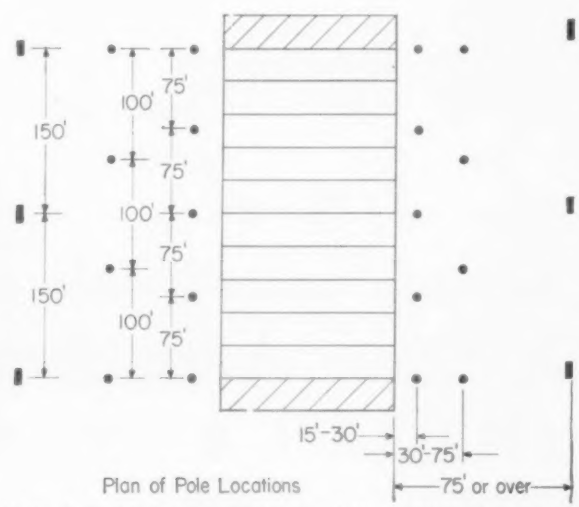
VRC-18

The Westinghouse VRC-18 floodlight, designed for efficient sports field lighting. Features swing-over bracket for easy maintenance. Hinged heat-resisting glass lens keeps the reflecting surface clean and protects the lamp from breakage, or from bugs and driving rain and snow. Accommodates 750, 1000 or 1500-watt general service lamps.

MILLITE

Wide distribution Millite provides direct lighting with incandescent or mercury lamps. This luminaire consists of a steel housing, Alzak Aluminum reflector, dust-tight hinged glass cover, and socket assembly. The glass lens is heat-tempered and will withstand severe impact. Lamp is protected from breakage and reflector is easy to clean. Millite is widely used for lighting school gymnasiums.

Westinghouse equipment is available for both indoor and outdoor school lighting. Here VRC-18 1500-watt floodlights illuminate the football field for night games.



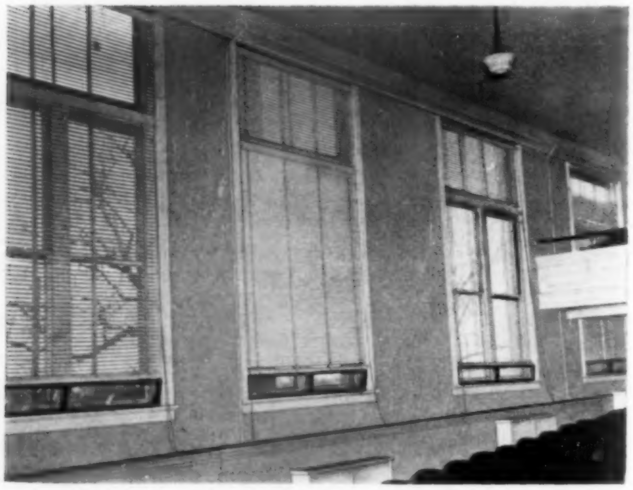
National Electric Manufacturers' Association (NEMA) Standard Layout for Football Lighting.

DISTANCE FROM EDGE OF FIELD	NO. OF POLES	1500-WATT FLOODLIGHTS		TOTAL LOAD IN KILOWATTS*
		UNITS PER POLE	TOTAL UNITS	
CLASS A INSTALLATION				
30' or under	10	12	120	208
30'-75'	8	16	128	222
75' or over	6	24	144	250
CLASS B INSTALLATION				
30' or under	10	8	80	139
30'-75'	8	12	96	167
75' or over	6	18	108	188
CLASS C INSTALLATION				
30' or under	10	6	60	104
30'-75'	8	9	72	125
75' or over	6	14	84	146
MINIMUM				
30' or under	10	4	40	70
30'-75'	8	6	48	84
75' or over	6	9	54	94

* 10% Over-Voltage

HOUGH SHADE CORPORATION

1028 Jackson Street, Janesville, Wisconsin



Guard

students' eyesight with

RA-TOX ANALUM VENETIAN BLINDS

The eyesight of young people is in your care for the important hours of each school day. Treat it gently. Give it the softest light possible. For maximum control of light coming in through windows, install RA-TOX ANALUM VENETIAN BLINDS in classrooms, auditoriums, laboratories and offices.

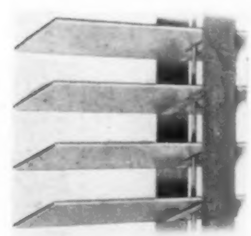
A special Alumulite* satin finish on the slats of RA-TOX ANALUM VENETIAN BLINDS provides a soft, highly diffused light and kills sun glare and disturbing reflections. This finish is an anodic treatment, applied electrolytically, producing a smooth, dense, integral coating of aluminum oxide. In addition to light diffusion, it also has the property of high corrosion resistance and low dust retention, promoting long life and easy maintenance. High heat reflection tends to keep rooms cooler on hot days, saves on cost of operating air-conditioning systems. Neutral gray in color, RA-TOX ANALUM VENETIAN BLINDS add to the beauty of any decorative scheme.

* Process Patented by Aluminum Company of America

The flexible aluminum slats are 60% lighter than steel, 50% lighter than wood . . . for easier lifting, less wear on cords, fewer repairs and fewer replacements.

TILTING MECHANISM has worm type gear for perfect slat adjustment, holding slats at any angle of tilt. Brass gear is mounted on steel shaft. Electro-galvanized finish. Bead chain (optional) prevents slipping and wearing of cord.

CORD LOCK: combination positive acting cord lock and tilt rail support, mortised into header. Slight pull to the left locks cord and holds blind at any height—downward pull unlocks cord. Heavy duty, strong and durable.



LADDER TAPE and CORDS: best quality, long strand ladder tape. Cross-straps are interwoven, not sewed. H o l l o w braided flexible cord, glazed to increase strength and reduce wear.

INSTALLATION BRACKET: a strong, trim-looking, practical bracket that holds both blind and facia board in a positive grip, permitting easy removal of either blind or facia.

RA-TOX VENETIAN BLINDS may also be had with wood, steel, or aluminum slats, all in enamel finish. Another product is the popular RA-TOX Wood Splint Ventilating Shade. Sizes are available to fit every type sash of either wood or metal. Designed and manufactured by the HOUGH SHADE CORPORATION, specialists in shading equipment for more than 45 years. Hough engineers are recognized leaders in shade design. Consult your nearest Hough representative about your shade and ventilation problems . . . or write for Bulletins.

COLUMBUS COATED FABRICS CORPORATION

DEPARTMENT U

Columbus, Ohio

BONTEX

WASHABLE

SHADE CLOTH

This is an actual swatch of Bontex Shade Cloth. It is made from high-thread-count muslin impregnated with durable pyroxylin. It is scrubbable with soap and water, is colorfast to sun's rays, resists rain, snow and wind, withstands rough handling. Superior for all window shade installations. Exceeds Federal specifications CCC-C-521a for shade cloth.

TEST THIS BONTEX SAMPLE

Clip off Bontex swatch at dotted line and place in boiling water for one-half hour. Remove Bontex swatch—twist it. crush it, TREAT IT ROUGH. Then hold to light. Positively no fading, pinholing, cracking or fraying!

Bontex No. 202

Wide Range for Every Window Shade Need

Bontex comes in many colors, patterns and designs for a wide range of utility and decorative needs and provides three distinct types of shade cloth—translucent, semi-opaque and opaque. Bontex **translucent** lets in maximum light without glare. Bontex **semi-opaque** provides a softer, more diffused light. Bontex **opaque**—absolutely black—excludes all daylight.

Bontex Quality Means a Real Saving

Whether you are interested in shade cloth for properly controlling daylight in homes, schools, hospitals, institutions, commercial or public buildings, Bontex readily fits into your ideas for modern economical planning. Its extreme durability and lasting beauty provide longer service at lower cost per year. Bontex quality saves money and gives greater satisfaction.

Bontex Is Pyroxylin-Impregnated, Waterproof, Colorfast—Will Not Pinhole, Crack or Fray

Bontex pyroxylin-impregnated shade cloth is impervious to water, grit and grime. It is also colorfast and will not pinhole, crack or fray—as proved by impartial scientific tests. **(See boiling test, first column.)** As a result, Bontex gives longer service and keeps its like-new appearance for years.

Withstands Scrubbing More Than 20 Times

Bontex can be scrubbed with soap and water more than 20 times for removal of soiling, including stains, and will retain its original finish. This is but another example of Bontex's rugged durability—its genuine through-and-through quality.

Conforms to Rules of Eyesight Conservation Council

Bontex provides tempered sunlight—toned down to the right intensity—for less eyestrain in schools, for more restfulness of patients in hospitals, for higher efficiency in laboratory or office and for greater comfort in the home. Bontex translucent, semi-opaque and opaque shade cloths all conform to rules of the Eyesight Conservation Council and have proved their complete satisfaction in the nation's finest schools.

EDWARD MALLINCKRODT SCHOOL, 6012 PERNOD AVE., ST. LOUIS, MO.

Write for Free Sample Book

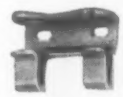
Get this handy sample book at once — sent to architects on request. Shows the complete Bontex line of plain colors, beautiful corded designs, duplex colors and modern printed patterns. Translucent, semi-opaque and opaque types.

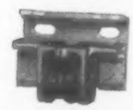
LUTHER O. DRAPER SHADE COMPANY

Dept. AS-48

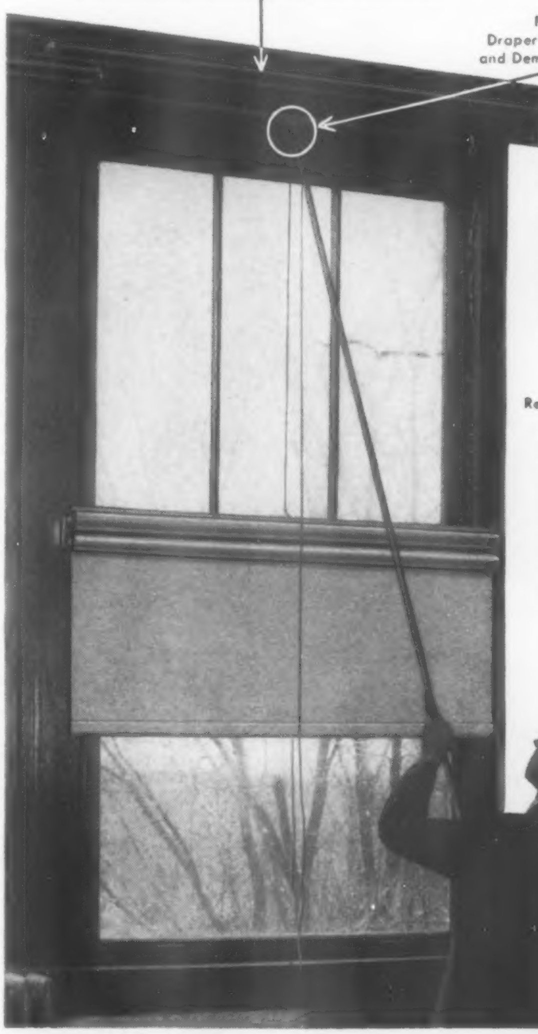
Spiceland, Indiana

Note position of the Draper X-L Unit of black shades over these windows—either or both sets of shades ready for instant use. (See description of X-L unit.)

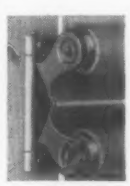




Patented Draper Pulley Bracket and Demountable Pulley



V-Shield Regular Mounting



V-Shield with Demountable Fixture

(PATENTED)

DRAPER V-DOUBLE ROLLER DEMOUNTABLE SHADE

For Installation on Either Wood or Metal Sash

The DRAPER FORTABLE PAKFOLD can take it—easy to transport from room to room, when and where needed. To apply this darkening shade or remove it, simply lift its supporting pulley from the pulley bracket, by use of the DRAPER PULLEY FORK.

When the PAKFOLD hangs over a double roller shade, as illustrated, both shades hanging on the face of the casings or wall—a pair of PAKFOLD SPRING CLIPS will hold the cloth close fitting around the double roller assembly, eliminating interference of the two shades and giving excellent darkening.

When not in use, the PAKFOLD is rolled up in a neat roll, with cover fastened by turn-buttons to keep it clean and in good condition, as illustrated.

PAKFOLDS are practical for large windows of unusual width or length and are made with two sets of pulleys and cords if shade size requires.

DRAPER SIGHT-SAVING SHADES

In planning school construction, the matter of window shades for best control of the light entrance should have influence on the window selection.

All windows can be shaded but some cannot in a practical way consistent with proper daylight control for a school room. Better eyesight attends the provision of best lighting, consequently the building should be planned for best lighting and proper shading.

Good classroom lighting involves the windows and window shades of equal importance. Therefore, in making the window choice—arrangement and setting—think of the best possible use of the natural daylight, applying such simple rules as follow:

(1) Width of window sash units not greater than 70" for easy one pulley control of upper shade.

(2) Window frames (if metal) to have side rails equipped with screws (threaded in holes at the factory) for attachment of shade roller brackets of the Double Roller Style. Top rails of each unit should have screws and holes for support of the shade lock pulley.

(3) A dummy fixture "L" plate should be held in place by these screws and marked "Shade Fixture Space." Thus in plastering the walls the valuable shade fixture space is reserved and ready for use.

The DRAPER PAKFOLD (PATENTED)

HOW MANY OF YOUR CLASSROOMS WOULD ONE SET OF PORTABLE PAKFOLDS DARKEN?

THE MICHAELS ART BRONZE CO., INC.

Second and Court, Covington, Ky.

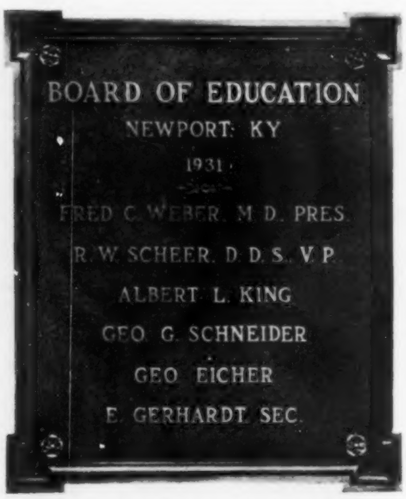
PRODUCTS

Bronze Tablets and Signs · Bronze Doors and Casement Windows · Name Plates · Office and Lighting Fixtures · Bulletin Boards · Building Directories · Railings · Desk Sets · Lamp Standards Grilles and Wickets · Radiator Grilles · Kick and

PRODUCTS

Push Plates · Push Bars · Time-Tight Exhibit Cases · MI-CO Parking Meters · Cast and Extruded Thresholds · Wire Work (Partitions, etc.) · Marquise, and many other ferrous and non-ferrous metal products.

Michaels Bronze Tablets and Signs are manufactured in a wide variety of designs, shapes and sizes to meet all school and college requirements. A few are illustrated below. Bronze, virtually indestructible, is the ideal metal for permanent memorials. It lends itself readily to the hands of skilled craftsmen and becomes more beautiful as time goes by. Many designs may be furnished from standard patterns or modeled to your specifications. We shall gladly submit sketches and quote prices. When necessary, additional blueprints will be furnished for approval. Just tell us the space, the purpose of the tablet, and the wording to be used. Fully illustrated folder will be sent on request.



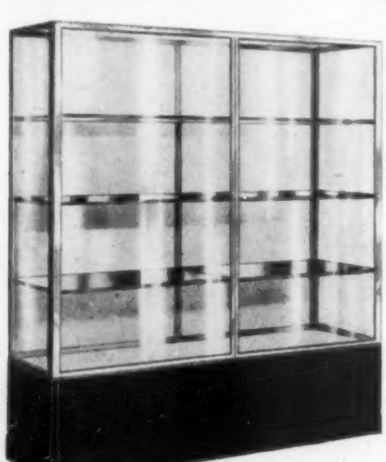
Bronze Tablets commemorate the construction of buildings or perpetuate the memory of public servants and benefactors who dedicated their lives to the service of mankind. Many designs, plain and ornate, in sizes to meet your requirements, are available.

Laurel design with contoured top. Bears intaglio portrait. Tablet size 21¾" x 23¾"

Bronze name plates in any size, with or without title

Perpetuate forever, in everlasting bronze, the names of all who served, and the memory of those who sacrificed their lives that our nation might remain free. Illustrated above is one of the many standard honor rolls produced by Michaels. If desired, bronze memorial plaques will be designed to meet your requirements.

Michaels *Time-Tight* Exhibit Cases with Innerlocking Frames



***Above:* Type 120**

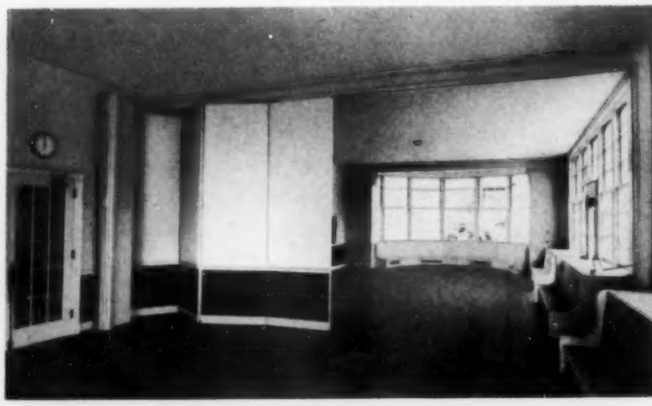
***Left:* Type 130**

Michaels Table Cases, Wall Cases, Aisle Cases, Suspended Cases, Recessed Cases, or Special Cases are manufactured with either extruded bronze or aluminum frames, and all have Michaels' exclusive innerlocking feature. Satin finish is standard, but if desired, electroplated or polished finishes may be supplied. Frames take full ¼" polished plate glass. Shelves of glass, ¼" or ½", depending on weight requirements, have all four edges polished. Shelf supports are adjustable every inch. Paracentric locks are standard in all locked cases. No screws are exposed on the face of frames except where necessary for removable or hinged panels. If illumination is necessary, it will be the latest and best type. Illustrated folder giving complete specifications will be sent on request.

RICHARDS-WILCOX MFG. COMPANY

1880— Aurora, Illinois —1948

BRANCHES: Atlanta · Boston · Chicago · Cincinnati · Cleveland · Des Moines · Detroit · Indianapolis · Kansas City · Los Angeles · Minneapolis New Orleans · New York · Omaha · Philadelphia · Pittsburgh · St. Louis · San Francisco · Seattle · Washington



Manually Operated Sound-Retarding "FoldeR-Way" Partition for Classrooms

R-W No. 780 Wood Receding Door Wardrobe

R-W SCHOOL PRODUCTS

GYMNASIUM FOLDING PARTITIONS

Originator of the DeLuxe fully automatic electric sound-retarding partition, the Richards-Wilcox Mfg. Co., now offers a complete line of automatic partitions for installation in gymnasiums or other large openings. R-W Automatic Partitions are 100% electric, require no manual work, and include this unqualified guarantee—you turn the Switch Key—R-W Does the Rest.

WRITE FOR CATALOG A-79

CLASSROOM FOLDING PARTITIONS

Schools are being built today to accommodate more pupils and provide greater utility thru the use of R-W Manually Operated Sound-Retarding Partitions. R-W FoldeR-Way Partitions enable adjacent rooms to serve a triple purpose by providing complete room flexibility.

WRITE FOR CIRCULAR F-135 AND CATALOG A-79

NO. 780 RECEDING DOOR WARDROBES

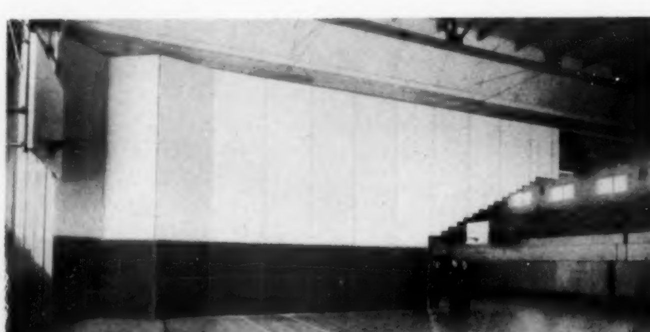
This R-W Wardrobe provides for individual operation of all pupils' doors and permits them to recede entirely into the recess. Thru the use of the offset top and bottom pivots joined together into a single unit by a steel connecting shaft, this wardrobe equipment becomes the heaviest, sturdiest, and most rigid unit ever produced.

WRITE FOR CIRCULAR F-121

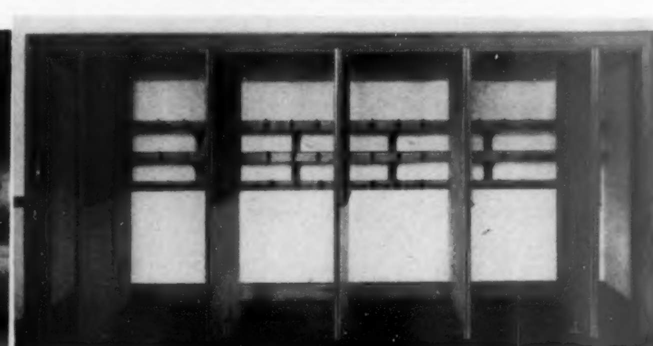
NO. 883 MULTIPLE OPERATION WARDROBES

Each wardrobe is provided with a master door latch and multiple control mechanism to permit multiple operation of the pupils wardrobe doors. A standard design is available for all classroom widths. Doors recede within 4" of the hat and coat rack.

WRITE FOR CIRCULAR F-122



R-W DeLuxe Fully Automatic Electric "FoldeR-Way" Partition for Gymnasium Installations



R-W No. 883 Wood Multiple Operation Wardrobe

THE STANLEY WORKS

New Britain, Conn.

HARDWARE FOR SCHOOL WARDROBES

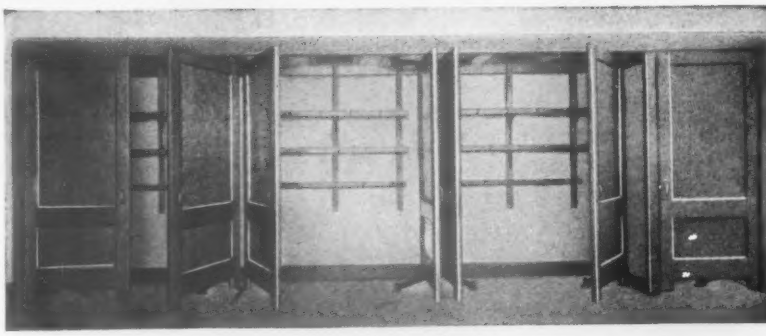
STANLEY
TRADE MARK

2705 B1—For Single Doors
2705 B2—For Pairs of Doors

With 1¼-in. clearance between door stiles and floor, and bottom rail cut out between stiles to make 4-in. clearance.

2705 C1—For Single Doors
2705 C2—For Pairs of Doors

With 4-in. clearance between door and floor.



A Typical Installation

Stanley offers complete, practical hardware for equipping doors from 18 to 48 in. in width, and any height, with a minimum depth of 25 in. from outside face of door to plaster wall. Two-foot doors project only 2 in. beyond front end of wardrobe when open, which does not hinder passage of pupils. Special hardware can be furnished for wardrobes having minimum depths to 18 in., but in such cases, two-foot doors will project up to 8 in. into the passage way.

OPERATION

Doors are hung in pairs, with single doors at the ends if desired. Pairs of doors operate in unison. It is necessary to pull only one door, to open or close both doors.

INSTALLATION

No mullions or partitions are necessary. Made to set the doors from 1¼ to 4 in. above floor. Special clearances on order. It is preferable to set the doors up from the floor to provide ventilation. The maximum space taken up in the wardrobe is 5 in. for two 1⅜-in. doors.

SECTIONS

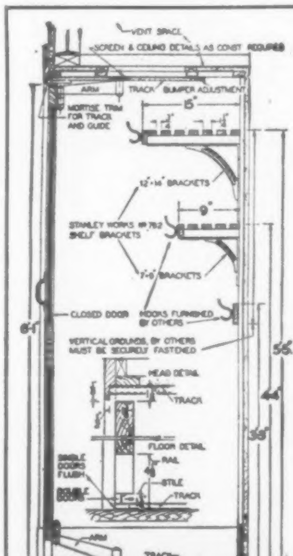
The number of sections that can be had in a unit is unlimited. Three four-foot sections are usually sufficient for the average classroom, as each section provides for seventeen pupils. A single two-foot section on either end provides the teacher's locker.

HARDWARE

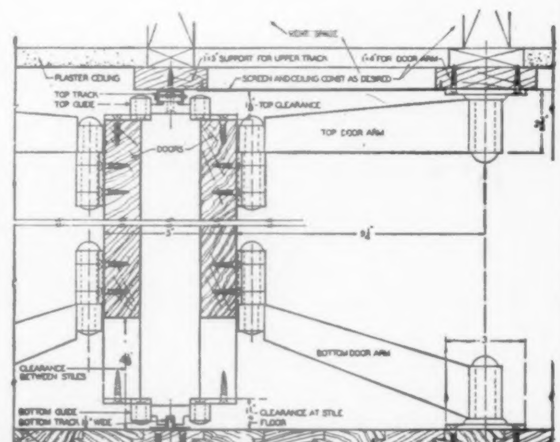
The extra heavy steel hinges will carry over 300 lbs. The hinge arms are 8¾ in. long, ¼ in. in thickness and set well back to avoid any tripping hazard. The pins are grooved for lubricant.

The top track and bottom rail are made of wrought steel; the guides are bronze. The bronze-on-steel bearing surface minimizes wear and insures smooth noiseless operation. Track and rail do not in any way hang or support the doors; they guide them. There is sufficient friction to prevent the doors from slamming. The track is fitted with rubber bumpers to insure quiet operation.

Details

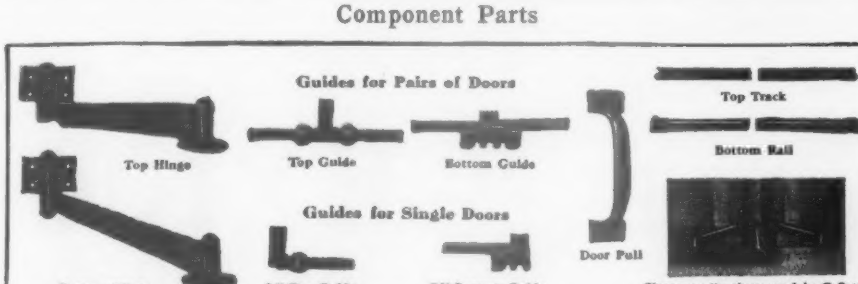


Section Through Doors in Closed Position



Section Through Doors in Open Position

Component Parts



THE ELECTRIC STORAGE BATTERY COMPANY

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

Atlanta 3, Ga., 210 Walker St., S. W.
Boston 34, Mass., 100 Ashford St.
Chicago 9, Ill., 5335 S. Western Blvd.
Cincinnati 2, Ohio, 718-19 Temple Bar Bldg.
Cleveland 14, Ohio, 1012 Engineers Bldg.
Dallas 1, Texas, 1511 Mercantile Bank Bldg.
Denver 2, Colo., 810 14th St.
Detroit 4, Mich., 8051 W. Chicago Blvd.
Kansas City 1, Mo., 129 Belmont Blvd.
Los Angeles 15, Calif., 1043 S. Grand Ave.
Minneapolis 2, Minn., 2340 Rand Tower
New Orleans 13, 406 Industries Bldg.
New York 18, N. Y., 23-31 West 43rd St.
Philadelphia 32, Pa., 17th St. & Indiana Ave.
Pittsburgh 19, Pa., 102 Frick Bldg.
St. Louis 3, Mo., 1218 Olive St.
San Francisco 24, Calif., 6150 Third St.
Seattle 4, Wash., 1919 Smith Tower Bldg.
Washington 6, D. C., 1819 L St., N. W.

In Canada: EXIDE BATTERIES OF CANADA, LIMITED, 153 Dufferin St., Toronto

The Exide Battery in The Research Laboratory of Physics, Harvard University. It is used for general service

FOR LABORATORIES, FIRE ALARM, PROGRAM CLOCKS, AUTO-CALL AND INTERIOR TELEPHONES

Exide Batteries are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services.

The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge. The operation of Exide Batteries is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. They assure exceptional long life in laboratory service. Many Exide Batteries in laboratory and industrial installations have been in constant use for 20 or more years.

Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. Moreover, the wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.

EXIDE EMERGENCY LIGHTING

Positive Protection Against Dangers of Sudden Lighting Failures

Either children or adults, you can never predict the actions of a crowd that is suddenly plunged into darkness. Danger is real. Danger of personal injury . . . danger to school property.

The utility companies take every precaution, but cannot control the effects of storms, floods, fires, and street accidents. Privately-owned plants, no matter how carefully planned and operated, may also have interruptions.

The only certain safeguard is an emergency lighting system that functions both instantly and automatically.

Electrical engineers agree that a storage battery, **properly maintained,** constitutes the most dependable source of emergency power. The new Exide Emergency Lighting, which automatically keeps the battery properly maintained, represents the qualifications found desirable from the experience of more than 3000 installations in all kinds of buildings.

During an electric service interruption, Exide Emergency Lighting Systems furnish power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors, exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895.

The exceptionally long life obtained from Exide Batteries used with the Exide Emergency Lighting System assures many years of dependable emergency lighting service.

IT'S THE FIRST 60 SECONDS THAT COUNT
Exide
EMERGENCY LIGHTING UNITS

A typical Exide Emergency Lighting System with a 60-cell Exide Battery and Control Unit. It operates instantly and automatically. The infrequent addition of water to the battery is the only maintenance required

Exide
BATTERIES

EDWARDS

Electric Signaling, Communication, and Protection Equipment

EDWARDS AND COMPANY, NORWALK, CONN.

In Canada: EDWARDS OF CANADA LTD.

SALES OFFICES AT: Atlanta • Baltimore • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Des Moines • Detroit • Jacksonville • Kansas City • Los Angeles • New Orleans • New York • Omaha • Philadelphia • Pittsburgh • Richmond • San Francisco • St. Louis • Seattle • Syracuse • Washington, D. C.

★ ***CLOCK AND PROGRAM SYSTEMS***

★ ***SCHOOL TELEPHONE SYSTEMS***

★ ***SCHOOL FIRE ALARM SYSTEMS***

GENERAL PRINCIPLES TO GUIDE YOUR CHOICE OF CLOCKS, PROGRAMS AND SIGNALS

Edwards and Company manufactures a wider selection of signaling equipment than any other manufacturer and the purpose of this listing is to show briefly the best, the most practical and most dependable. That does not mean the most expensive. Instead of confusing you with many alternatives, we give you here a dependable recommendation based on years of research. Some explanations follow: Synchronous Clocks show the correct time at each second of the day and night, are noiseless and dependable. They are a logical and modern advance over the old "minute jumper" clocks which were noisy and only changed time at each minute.

Automatic Resetting with dual motored clocks is certainly a modern necessity, and represents a minute fraction of the cost of any up-to-date building. A janitor travelling from room to room with a step ladder is a long and undependable process. Manual correction from a central push button is a poor substitute. Correction by overspeeding a single motor clock is an unnecessary strain on wearable parts.

A Program Instrument is the only way to assure smooth, systematic and punctual change of classes in any school no matter how small. To omit it and depend upon a principal or student pushing buttons at the right moment is false economy. Flush 12" Clocks are recommended. They cost no more than surface clocks, and a well designed building deserves their neater appearance. The 12" size has proved to be best for all locations.

Room Signals should be loud enough but not startling. The old idea of very loud corridor signals (and no room signals) is distinctly outmoded, first because noisy schools are inefficient schools, and also because all rooms do not change at the same time. For classroom use either a chime or a buzzer in the clock case is suggested.

Loud signals should be used in such locations as gymnasiums, lavatories, swimming pools, vocational rooms and outdoors. For these locations either a 6" bell or a horn is recommended. Outdoor signals should be watertight, and built to stand abuse. For added protection, a hood is recommended.

Avoid Confusion. There is no economy in trying to make one system do three jobs poorly instead of one job well. Don't try to make program bells call the teacher to the telephone; don't risk lives by having "three rings" on classroom bells warn of fire instead of having a fire alarm system designed for the job.

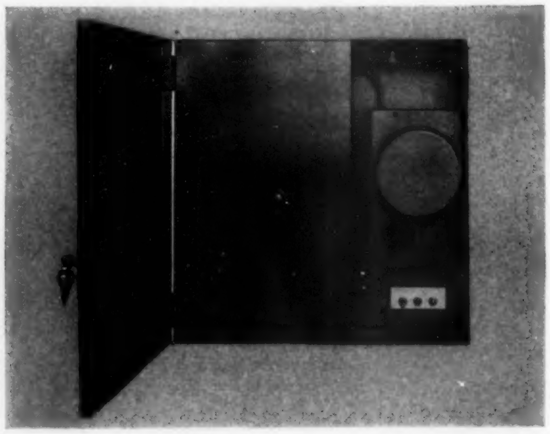
Edwards No. 1962 flush wall clock with 12" dial for classroom, corridors, etc.

Edwards No. 1978 double dial 12" clock for corridors, etc. Suspended from ceiling or side wall as desired

Edwards No. 1972 surface clock with 12" dial for existing buildings

See following pages of description for other signaling equipment

PROGRAM INSTRUMENTS — CONTROL BOARDS



CLOCK SYSTEM CONTROL

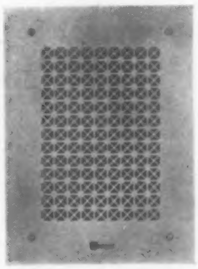
When clocks, signals and instruments operate as a system with common current supply, the central control permits easy, accurate correction for power interruptions plus providing uninterrupted time for up to 5 clocks or equivalent. The Automatic Control measures length of power interruption and causes clocks to operate from a second motor at an accelerated rate to correct time. Unit includes manual switches for daylight saving time corrections. Edwards No. 1902 automatic control is enclosed in metal cabinet with lock and key. Dimensions 18" x 18" x 6" deep. For flush mounting, add 2" to height and width, and allow 5¼" for box. Also available in manual control type No. 1900. Details on application.

PROGRAM INSTRUMENTS

If every room in the school operates on the same schedule (or program) every day in the week, a one-circuit program instrument will suffice. An additional circuit is necessary for every day that the schedule differs and when any grades operate a different daily schedule. If the school has only daytime sessions, or operates on any night schedule, a 24-hour program is standard. The multiple-circuit program instrument is available in 2, 4 and 6 circuit sizes. Program is set by inserting pins in cylinder holes. Signal duration is adjustable from 2 to 6 seconds. The multiple-circuit device (No. 1918 four-circuit illustrated) is enclosed in metal cabinet. Edwards No. 1910 Single Circuit Program Instrument for smaller installation. Details on application.

AUDIBLE SIGNALS

CHIMES FOR CLASSROOMS



No. 1985—Flush chime, two note, with wall box

No. 1984—Surface chime, two note

A chime signal has a more penetrating tone than a bell and without objectionable shrillness. Its pleasant musical note recommends it where the sharp piercing note of the ordinary bell would be out of place. Chimes are available in two types, for surface mounting and for flush mounting. Both chimes have a pleasing two-note sequence. The flush chime is mounted in a flush wall box and has an attractive grille. The surface chime is a simple neutral design to harmonize with the interior of the classroom. Finish, satin aluminum.

BUZZERS

Edwards No. 1983 Buzzer may be housed within the clock outlet box. Used in this way it takes no room or wall space, saves an additional outlet, and therefore is often preferred as a room signal. If found desirable to mount the buzzer separate from the clock, it is simply mounted in a single gang box for flush mounting or Wiremold fitting for surface use. Plate not furnished.

No. 1983. Buzzer, 115 volt—60 cycle, Approximate Shipping Weight—6 oz.

BELLS

No. 560—8" Bell

No. 1987—4" Bell

The Adaptabel's simplicity of installation and excellent tone quality make it ideal for use in corridors, playrooms, lavatories, vocational rooms, gymnasiums and classrooms. The 4" size is for classroom use, the 4" or 6" bell is used in playrooms, corridors, and vocational rooms. Mounts directly on wall box.

6" or 10" bells have back plates that mount directly on the wall for open wiring or on standard boxes. Electrical connections are made on this plate. The bell hangs on two lugs on the plate and is pressed home to make contact. The 6" size is recommended for corridors and gymnasiums; 10" bells for outdoor mounting.

MODEL NO.	DESCRIPTION
1988	4" Bell
1988	6" Bell
1988	10" Bell

Add letters "WPF" to catalog number if for outdoor mounting. And for this service, a No. 1995 guard is recommended. See listing below.

HORNS

Edwards Horns are powerful, pleasant-appearing signals. A back plate mounts directly on the wall for standard boxes, making mounting a simple, easy job. Available in two types—for indoor and outdoor applications. Yard type guard is recommended for use with outdoor type horn.

No. 311. Indoor Type Horn 115 volts 60 cycles, 5 lbs., 3 ozs., shipping weight.

No. 1994. Outdoor Type Horn, 115 volts 60 cycles, 5 lbs., 3 ozs., shipping weight.

No. 1995. Yard Type Guard for No. 560 WPF 6" and 8" Bells or No. 1994 Horn.

No. 1996. Yard Type Guard for No. 560 WPF 10" and 12" Bells.

SCHOOL TELEPHONES AND SCHOOL FIRE ALARM SYSTEMS

FOR CLASSROOMS

Flush telephone instrument for classroom is attractive, modern and can be painted (on the job) to match wall color. High quality precision instrument.

Edwards No. 2130.

FOR PRINCIPAL'S OFFICE

With Edwards Telephone Instrument for principal's office, it is no longer necessary for the principal to leave his desk to ring the desired classroom, then return to his desk. Edwards No. 4653 Cradle Desk Telephone is available with buttons on the instrument. For side of desk mounting, telephone handset No. 4665 with separate push button pad, mounted on top of desk is recommended.

TELEPHONE SWITCHBOARDS FOR LARGER SCHOOLS

Edwards has specialized in the telephone switchboard for schools, institutions, etc. Larger schools require communication between rooms and the interior switchboard is the most satisfactory for this purpose.

SCHOOL FIRE ALARM SYSTEMS

THE Edwards Closed Circuit Coded Fire Alarm Systems (SS for D.C., and SSA for A.C. Operation) are accepted as standard by practically every fire prevention authority in the United States and Canada, and in addition are approved by the Underwriters' Laboratories. Operation of any station sounds that station's code, and shows its location. Each station has its own code mechanism, so failure of one station does not make the system inoperative.

The Control Panel is the nerve center of the system. The number of circuits depends upon the number of signals. The control panel contains relays to supervise the circuits electrically. It is also provided with milliameter, fuses, resistance units and necessary terminals for all wire connections. The panel is enclosed in a steel cabinet suitable for surface or concealed wiring, as specified. A trouble bell is provided which rings constantly in case of an open circuit or other disarrangement until the trouble is removed.

Annunciators · Bells · Burglar and Protection Alarm Systems · Buzzers · Door Chimes · Horns · Hospital and Infirmary Signaling Systems · Lokator Code Calling Systems · Push Button Switches · Return Call Systems · Signaling Transformers

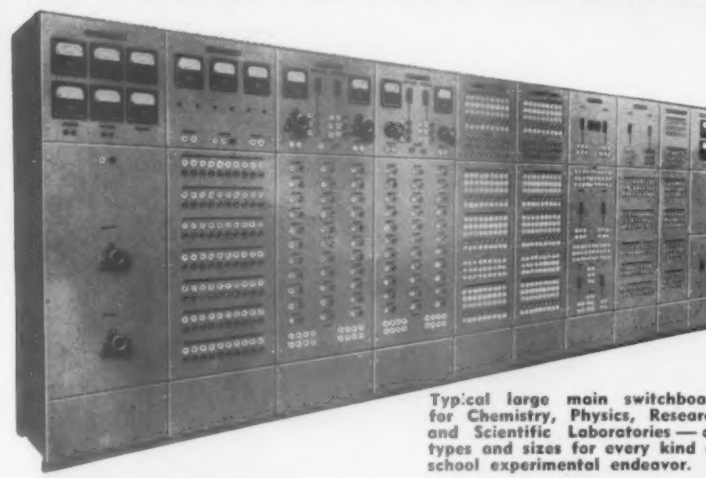
Wm. WURDACK ELECTRIC DIVISION

FEDERAL ELECTRIC PRODUCTS COMPANY

4446 Clayton Avenue   Saint Louis 10, Mo.

Experimental Laboratory Switchboards and Light and Power Distribution Boards

MAIN SWITCHBOARDS AND SUB-SWITCHBOARDS FOR CHEMISTRY AND PHYSICS LABORATORIES



Typical large main switchboard for Chemistry, Physics, Research and Scientific Laboratories — all types and sizes for every kind of school experimental endeavor.

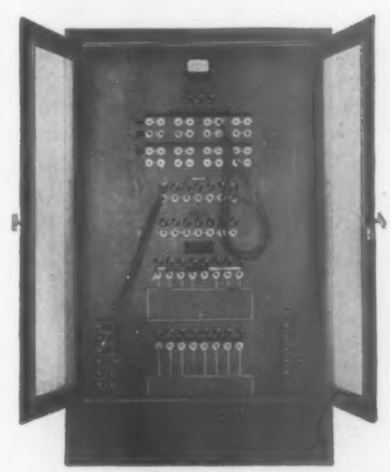
FEDERAL NOARK Switching and Control Equipment is designed to facilitate scientific research and experimental work in schools and colleges. Electrical energy is extended from the Main Switchboard to classrooms, tables and laboratories.

SERVICE OUTLETS

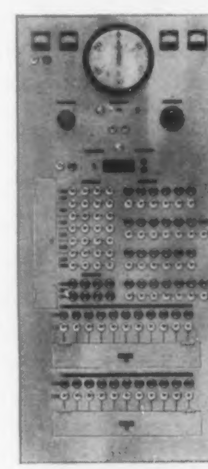
Enclosed service outlets for table or pedestal mounting. Supplied with base to rigidly support outlet and conceal conduits. In various combinations including single and double face.

Flush type service outlets in all types of combinations supplied with recess box of code guage steel for mounting flush in work tables, desks or in walls.

FEDERAL NOARK Cord Sets, color coded, are supplied with male and female plugs — spade lugs or pin plugs.



Glass enclosed type of sub-switchboard installed in College Physics Laboratory.



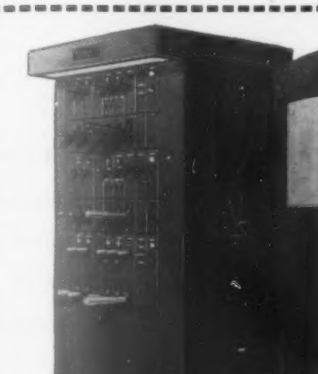
Laboratory Switchboard with Telechron Timer installed in small high schools.

POWER AND LIGHT DISTRIBUTION SWITCHBOARDS

Federal supplies the finest in modern fusible and circuit breaker electrical distribution panelboards and switchboards for the control of light and power in schools, colleges, etc.

AUDITORIUM AND STAGE LIGHTING SWITCHBOARDS

The FEDERAL NOARK Flexi-Lite Pilot and Dimmer Control is recommended for schools, colleges and dramatic centers. Designed for ease of operation and great flexibility.



Send for special Wurdack Division Catalogs on Experimental Laboratory Switchboards, on Fusible Panelboards and on Circuit Breaker Panelboards. Federal engineers are always at your service for consultation on electrical control equipment.

GRAYBAR ELECTRIC COMPANY, INC.

Executive Offices: Graybar Building, New York 17, N. Y.

CONVENIENT LOCAL SERVICE FROM OFFICES AND WAREHOUSES IN 100 PRINCIPAL CITIES

Aberdeen, S. D.	Dallas, Texas	Lansing, Mich.	Portland, Me.	Tulsa, Okla.
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Corpus Christi, Texas	Knoxville, Tenn.	Pittsburgh, Pa.		

* Sales office only

AN ALL-INCLUSIVE ELECTRICAL SUPPLY SERVICE FOR SCHOOLS AND UNIVERSITIES

Through its nation-wide network of warehouses and offices, GRAYBAR distributes the products of more than 200 of the nation's leading manufacturers of electrical equipment and supplies. Its services are based on 79 years of experience in the electrical field.

Experienced GRAYBAR Representatives and equipment Specialists perform many useful functions for the school architect, the electrical contractor, and the buyer of electrical maintenance supplies—going far beyond mere "order-taking."

AID IN ELECTRICAL PLANNING

GRAYBAR is fully informed on modern equipment for school lighting, communication, signaling and alarm systems. Specialists familiar with school installations in many communities will advise on choice of equipment and planning of the system you desire.

FAST-DELIVERY SERVICE

From its nearest warehouse, GRAYBAR can deliver hundreds of electrical items promptly. That's good to remember in emergencies; often saves valuable time on everyday requirements, too. Plan ahead for delivery of scarce items on schedule. 4839

CALL THE NEAR-BY GRAYBAR OFFICE FOR . . .

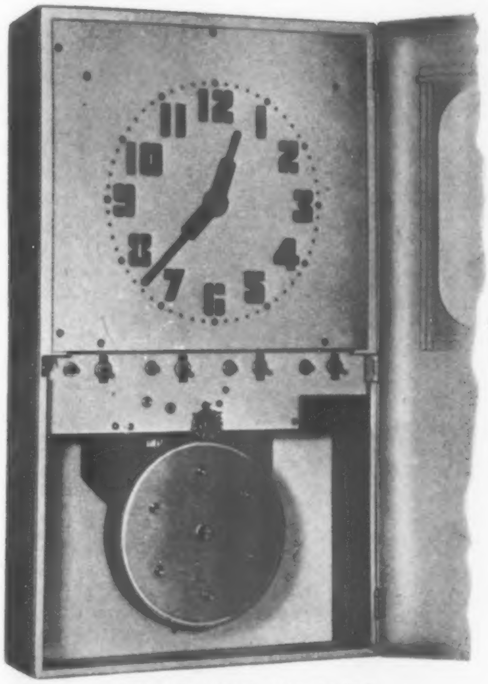
ALARM SYSTEMS • ANNUNCIATORS • APPLIANCES • AUDIOMETERS • BATTERIES • BELLS • BUZZERS • CABLE • CALL SYSTEMS • CIRCUIT BREAKERS • CLOCKS • COMMUNICATION • CONDUIT • CONTROLLERS • CORDS • DRY CELLS • FANS • FITTINGS • FIXTURES • FLOODLIGHTS FLUORESCENTS • FUSES • HEARING AIDS • [illegible] • INSTRUMENTS • INTER-PHONES • JUNCTION BOXES • LAMPS • LUMINAIRES • METERS MOTORS • PLUGS • PANELBOARDS • OUTLETS • RANGES • RECEPTACLES • RECTIFIERS • REFLECTORS • SIGHTMETERS • SIGNALING • SIRENS SOCKETS • SOUND SYSTEMS • STREET LIGHTS • SWITCHES • [illegible] • TELEPHONES • TESTERS • TRANSFORMERS • TOOLS • VOLTMETERS • WIRE

MONTGOMERY MFG. COMPANY

Manufacturers of Synchronous Program Clocks

553 West Washington Blvd. — Chicago 6, Illinois

Factory: Owensville, Ind.



MONTGOMERY PROGRAM CLOCKS AND CIRCUIT ACCESSORIES . . .

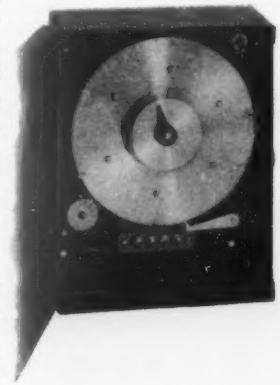
FOR ACCURATE, DEPENDABLE, TROUBLE-FREE AUTOMATIC SIGNALS WITH BELLS, HORNS OR BUZZERS ON ONE TO FOUR SEPARATE CIRCUITS

Because of their unusual flexibility, simplicity and rugged, long-life dependability, Montgomery Program Clocks are ideally suited to the requirements of school time-signal systems.

They Are Simple—Program setting is easy—simply the placement of spring clips in numbered slots on the program discs. This is done by hand—no tools required. Both clock and mechanism are completely synchronized and time-set by movement of the clock hands. Installation is simple—can be accomplished by any competent electrician.

They Are Flexible—Montgomery Program Clocks are available in six standard models for one, two and four circuits. Program discs are for either 12- or 24-hour cycles. There are 288 slots in each disc, allowing for even the most complicated schedule. Signal intervals are each 2½ minutes on a 12-hour cycle and each 5 minutes on a 24-hour cycle. The signal, itself, may be readily regulated to any desired duration from 2 to 30 seconds. The automatic calendar switch silences all signals for any predetermined regular period (such as Saturdays and Sundays). All clocks are provided with circuit cut-out switches and manual ringing switches for special, non-scheduled signalling. On multiple-circuit clocks, this manual signal switching is provided for each circuit. Manual signalling does not interfere with automatic program signals.

They Are Attractive—In addition to its value as a fully automatic, dependable time-signalling unit, the Montgomery Clock is a most attractive office time-piece. It is available in two sizes—11 inches high, by 8 inches wide, by 6 inches deep for the single- and two-circuit clocks—and 24 inches, by 14 inches, by 6 inches for the four-circuit clocks. They are completely enclosed in modern formed steel cases, finished in rich old ivory baked enamel. Dials are attractive, large and easy to read.



New Industrial Timers—These new type TP and type TS Montgomery Industrial Timers meet a long standing requirement for simplicity and economy. Their design provides a brass dual-disc face without the usual clock numerals, but performing the same functions. Size of steel case is 4½" x 8" x 10" and finished in attractive black crackle. The TS timer, for instance, will close a circuit at any five minute time as set up by program pin and at later set time open it. Most machine applications probably will fall under the model TS unit. Due to the advanced design of these new industrial timers, they are available at the remarkably low price of $49.50 each.

SPECIFICATIONS AND PRICES

The "P" series four-circuit clocks—illustrated above—24" x 14" x 6"—

P124 (2½-min. intervals, 12-hr. program discs)	**$253.00**
P244 (5-min. intervals, 24-hr. program discs)	**253.00**

The "L" series two circuit clocks—illustrated at bottom—11" x 8" x 6"—

L12 (2½-min. intervals, 12-hr. program discs).	**94.50**
L24 (5-min. intervals, 24-hr. program discs)...	**94.50**

The "M" series single-circuit clocks—same appearance as "L" series—11" x 8" x 6"—

M12 (2½-min. intervals, 12-hr. program discs)	**$70.00**
M24 (5-min. intervals, 24-hr. program discs) ..	**70.00**
TP (5-min. intervals, 12-hr. program discs ...	**49.50**
TS (5-min. intervals, 12-hr. program discs) ...	**49.50**

(Shipments FOB Owensville, Ind.—Excise tax not included)

MONTGOMERY CIRCUIT ACCESSORIES

Every satisfactory program clock installation requires the use of good grade signals. These guaranteed standard accessories are available for Montgomery Program Clocks:

ATL-700 Bells, heavy duty, weather-proof for either outside or inside use:

	8 or 12 volts	24 volts	115 volts
4-inch	**$27.00**	**$17.75**	**$23.50**
6-inch	**33.00**	**23.50**	**29.50**
10-inch	**44.75**	**35.25**	**41.25**

Not available for 8-volt service.

No. 161 Bells, loud ringing, for interior use only:

	6 to 12 volts	24 volts
4-inch	**$4.15**	**$5.90**
6-inch	**5.30**	**7.10**

No. 577 Buzzers—ample sound for classroom, volume adjustment:

6 to 12 volts **$3.20** 24 volts **$3.20**

No. 122 and 124 Horns, klaxon type, weather-proof—loud, clear tone of volume equal to that of 10-inch bell. No. 124 is two-way.

	12 volts	24 volts	115 volts
No. 122	**$25.60**	**$22.10**	**$22.10**
No. 124	**33.00**	**29.50**	**29.50**

No. 110VA Transformer—for reducing 115-v., 50-60 cycle AC to 4-8-12-16 volts or to 24 volts—**$14.15.**

Other types of signals and other operating voltages are available on special order.

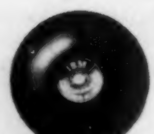
Montgomery Program Clocks and Circuit Accessories are available at your local school supply dealer. Please address all inquiries to Montgomery Mfg. Company, 553 West Washington Blvd., Chicago 6, Ill.

INTERNATIONAL BUSINESS MACHINES CORP.

WORLD HEADQUARTERS BUILDING

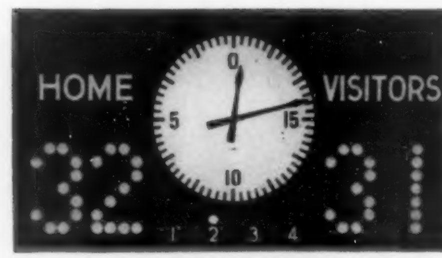
590 Madison Avenue, New York 22, N. Y.

Equipment for Schools of Every Size



Coordinated Time Systems

IBM Electric Time Systems coordinate activities in any school or institution. One Master Control unit regulates automatically all corridor and classroom clocks. The ceiling mounted clock illustrated is particularly adaptable for use in corridors. All bells (like the one illustrated), gongs, and buzzers — in classrooms and on playgrounds — are synchronized with the Control, providing accurate scheduling of classes, assemblies, and recreational activities.



Electric Scoreboards

IBM Electric Scoreboards provide a fast, accurate means of indicating the official time and score at games. All-electric and operated by a press-box control, these scoreboards are made up for baseball, basketball, football, hockey, and multi-purpose use.

Landmarks of Time

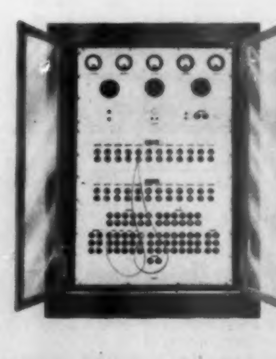
IBM Tower Clocks and outside clocks, designed to match the architectural styles of the buildings, have become "landmarks of time" on the leading banks, department stores, schools, universities, municipal buildings, industrial concerns of the country. Regulated by the same Master Time Control which controls the other time indicating, recording, and signaling equipment throughout the building, an IBM Tower Clock shows accurate, uniform time on all faces.

Fire Alarm Systems

IBM Fire Alarm equipment is furnished in types designed to meet the requirements of local and state fire regulations. Alarms may be sounded by bells, gongs, sirens, or horns.

Laboratory Panels

IBM Laboratory Panels, for use in the science departments of high schools and colleges, are designed to deliver current of different characteristics and voltages to instructors' and students' tables or to any location where electricity is needed for experimental purposes.



The Most Modern of Electric Clock and Program Systems

2-WIRE AUTOMATIC RESET

The new *Standard* 2-wire automatic reset system provides accurate time on all secondary clocks and program machine. It is arranged to compensate for current failures up to 25 minutes in any one hour and to synchronize all secondary units, whether fast or slow, with the master clock automatically every hour.

The system operates from AC lighting service through a rectifier which gives two voltages: 24V for the regular operation and 48V for automatic resetting. One great advantage of its resetting feature is its *instantaneous* and *silent* operation.

FOR OLD BUILDINGS

The *Standard* 2-wire automatic reset system is not only the most reliable and economical for new buildings, but also is particularly well adapted to replace clock systems in old buildings without changing the wiring, provided it is in satisfactory condition, thus bringing the system up to date.

MASTER CLOCKS

The master clocks are self winding with 60 beat invar pendulums guaranteed to keep correct time within 10 seconds per month and in some models having reserve power to run up to 8 days. The cases are regularly furnished of oak or birch in several designs for flush or surface mounting. The master clock operates any number of secondary clocks as well as the program instrument.

SYNCHRONOUS MASTER PROGRAM CLOCK

This is a very efficient unit with the same program instrument as described for the 60 beat master clocks directly geared to the 12″ time dial making it impossible for either to get out of step with the other. It is run from the 115V AC lighting service by a heavy duty, long life synchronous motor, and is provided with contacts, relays, etc., for operating secondary clocks. The movement can be furnished with the 2-wire automatic reset mechanism to keep all the secondary clocks in time with the master clock.

Case is regularly made of birch for surface mounting, but flush cases can be furnished when required.

SECONDARY CLOCKS

Standard secondary clocks are the 2-wire automatic reset type, made in a wide variety of sizes and designs, a few of which are shown below.

ROUND METAL CASE CLOCK

This can be furnished for flush or surface mounting. Shown here is a flush type with very narrow rim, finished in lacquer or polished aluminum.

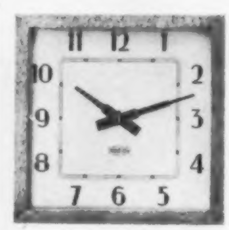
The list FMT-12 with 12″ dial, is a flush model of size and type generally used in most locations.

All flush secondary clocks are furnished with the necessary back boxes so they may be built into the wall. They are provided with suitable clock hangers.

SPECIAL CLOCK

The clock illustrated is furnished with plain 5-minute markers and is suitable for mounting on plaster walls, wood paneling or other plain surfaces.

Many other designs of special clocks can be furnished, some with marble dials, skeleton dials with rings and without, or illuminated outside weather-proof clocks.



SQUARE WOOD CASE CLOCK

These are made for flush or surface mounting, regularly furnished with oak or birch cases.

List	SSD-10	10″ dial surface
List	SSD-12	12″ dial surface
List	FSD-10	10″ dial flush
List	FSD-12	12″ dial surface

DOUBLE-DIAL CLOCK

Standard Double-Dial Clocks are made for either ceiling or side wall mountings. Cases are spun aluminum, mounted on birch bracket finished as desired.

List 506	12″	List 508	16″
List 507	14″	List 509	18″

Double-dial clocks are used most generally in corridors and similar places. Other designs are also available.

PROGRAM INSTRUMENTS

These are the minute-interval tape type and are furnished for 2 or more circuits or program schedules of 12 or 24 hours' duration. They are usually mounted in the master clock case, but a separate case can be furnished if desired.

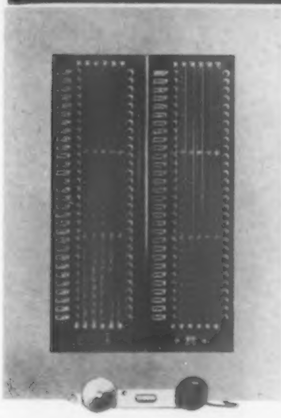
BELL CONTROL BOARDS

Bell control boards are furnished so that any individual signal may be placed on any program schedule required, and signals may be rung manually. See "Telephones."

PROGRAM SIGNALS

Various types of program signals are furnished according to locations. For instance, buzzers mounted inside the secondary clocks are standard for the classrooms. 6″ underdome gongs (as illustrated) are suitable for corridors, gymnasium, cafeteria and similar places. Horns are desirable in especially noisy locations, such as shops. For outside use, horns or 10″ gongs with housing and screen are usually employed.

Standard School Telephone Systems



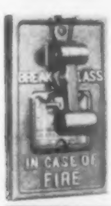
The *Standard* telephone system is considered the simplest and most efficient type for school use. Because of this simplicity, maintenance cost is kept at an absolute minimum. By adding a master desk or wall phone, buzzer and relay, it utilizes the bell control board as a central telephone station. Room buzzers become telephone signals when they are given two short rings from the central station, which differentiates them from program signals. Thus, the expense of additional signals and wiring is saved.

This system is a selective-ringing, common-talking type, with all calls routed thru the central station. Different types of phones for the rooms are furnished as required.

Standard Fire Alarm Systems

TYPE MC CLOSED CIRCUIT SYSTEM

This is regarded as the best type for school and similar buildings. It is a supervised, closed-circuit, master code system, comprising a control panel, No. 451 Break-Glass stations, and single stroke gongs or horns. It operates directly from the 115V lighting service.



In case of an open circuit in the wiring or equipment an emergency bell on the panel will ring. A switch and red pilot lamp are provided to silence this bell until the trouble is found and repaired.

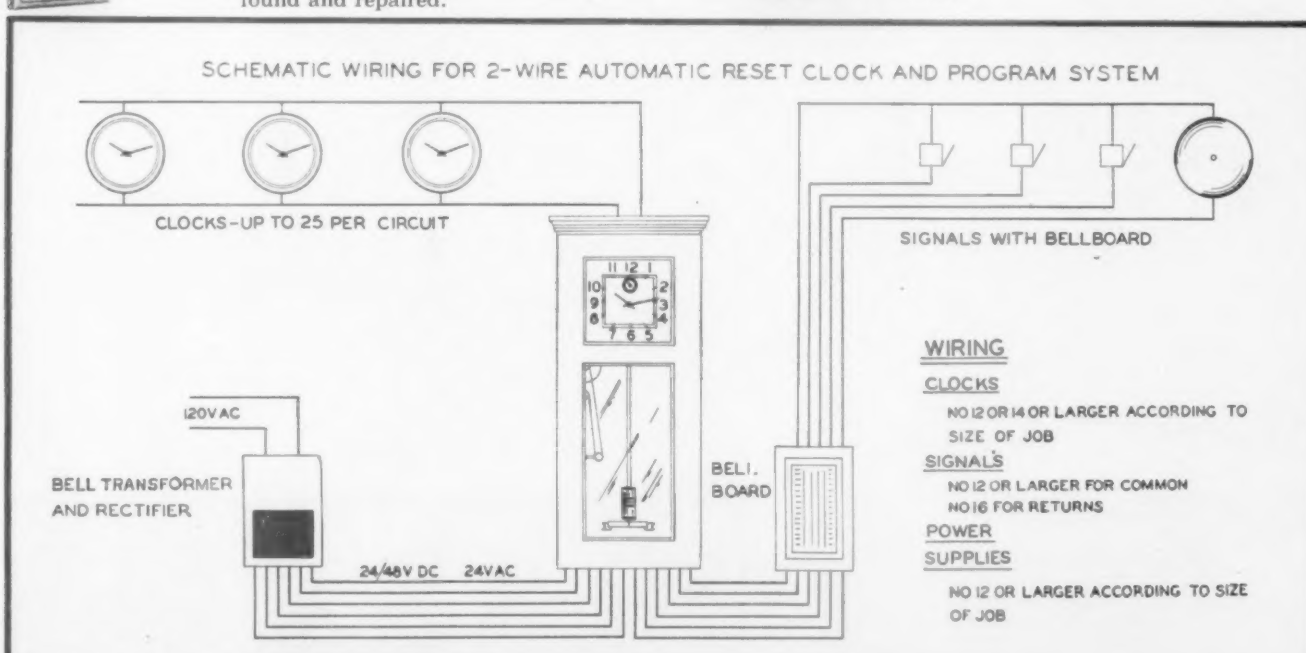
OTHER TYPES OF SYSTEMS

Standard manufactures many other types of fire alarm systems for different conditions, using coded stations, pre-signals, etc. Such kinds would be used in the larger buildings and also in institutions comprised of one or more buildings where one inter-connected fire alarm system is desired.

Simpler and less expensive systems of the open circuit non-supervised type are also made for small buildings as required. Full information will be furnished on request.

FIRE ALARM SIGNALS

Different types of signals can be furnished according to the systems and location. The 6″ single stroke gong (illustrated left) is standard in most cases.



Standard Laboratory Equipment

In general this equipment is for furnishing and distributing all kinds of electrical services to any locations in laboratories, lecture rooms and other places where they might be required for experimental purposes.

These services may be AC of different voltages, phases and frequencies; DC of different voltages; time impulses, etc. Following is a list of places where they are generally used.

FOR HIGH, TRADE AND TECHNICAL SCHOOLS

Physics, Chemistry & Biology Laboratories
Electric Shops

IN COLLEGES AND UNIVERSITIES

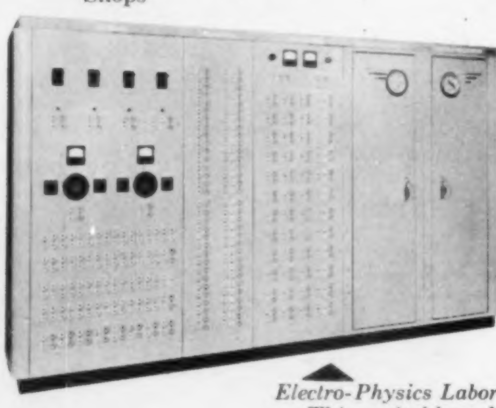
Physics
Chemistry
Chemical Engineering
Physiology
Pharamacology
Biology
Psychology
Research
Electrical Engineering
Shops

Standard designs, manufacturers and furnishes for this work the following:

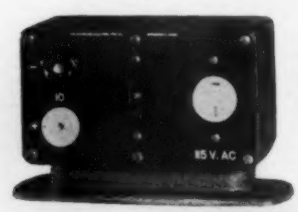
- Main control boards
- Distribution panels
- Table and wall service units
- Special test panels
- Demonstration transformer bench unit
- Motor generators
- Loading units of various types
- Storage batteries
- Battery charging equipment
- Impulse machines
- Precision electric timers
- And many other items

Except for the average high school, where requirements are about the same and for which we have worked out some standard equipment, each job has to be laid out according to its individual requirements.

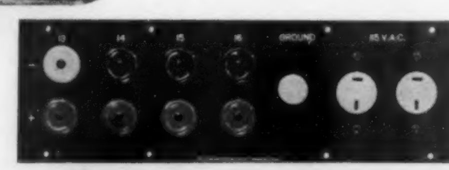
Standard engineers have had many years' experience in laying out all types of laboratories for schools, colleges and industrial plants the country over. Their services are offered, without obligation, to assist you in planning for this type of equipment.



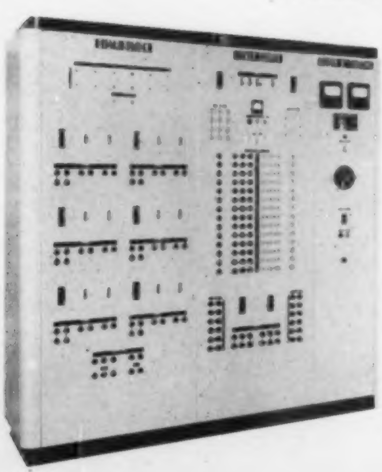
Electro-Physics Laboratory, West Point — This switchboard has various AC and DC power supplies required for this type of laboratory. The last two sections contain electronic equipment.



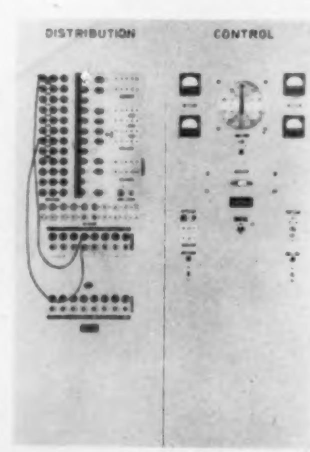
A 3-gang single or double face pedestal type table unit, having jacks and switch for one variable voltage circuit and an AC receptacle.



This illustrates a panel suitable for a lecture room table and has jacks for 4 variable voltage circuits, a ground connection and 2 AC receptacles.



Electrical Engineering Building, University of Rochester — This is a totally enclosed dead front switchboard for AC and DC power control and distribution to different locations in the laboratory, and contains complete battery charging equipment.



A laboratory control and distribution switchboard suitable for an average High School. It contains a "Standard" laboratory timer as illustrated.

THE STANDARD ELECTRIC TIME COMPANY
SPRINGFIELD 2, MASSACHUSETTS
BRANCHES IN ALL PRINCIPAL CITIES

PRINTED IN U.S.A.

FURNITURE AND EQUIPMENT

(Administrative—Instructional—Operating)

Audio-Visual Aids
Classroom Furniture
Library
Office
Auditorium and Stage
Cafeteria and Kitchen
Dormitory
Homemaking Laboratory
Science
Shop
Lockers and Locks
Health and Physical Education
Bleachers and Grandstands
Floodlighting
Playground

RADIO CORPORATION OF AMERICA

EDUCATIONAL SALES DEPARTMENT

Camden, N. J.

RCA VICTOR 2-SPEED TRANSCRIPTION PLAYER

for phonograph records and 16-inch transcriptions

A high quality portable player for classroom reproduction of either standard phonograph records or 16-inch transcriptions. It is an ideal school instrument for music appreciation, social studies, and many other applications. Headphone jack for library use.

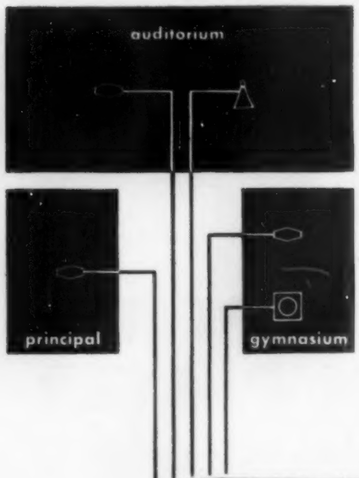
Two separate motors supply positive, constant speed to the turntable—one for 33⅓ rpm and one for 78 rpm. A two-position switch, for music or for voice, plus a wide-range tone control, ensures maximum performance at high or low volume. Detachable loudspeaker provides brilliant reproduction of all voices and musical instruments. Weight under 30 lbs. Sturdily built and attractively styled luggage-type carrying case.

RCA CLASSROOM SLIDE FILM PROJECTOR

Dual-purpose for 2" x 2" slides and 35mm Filmstrips

Here is a dual-purpose projector priced so low that *every classroom* can now be equipped with its own projector.

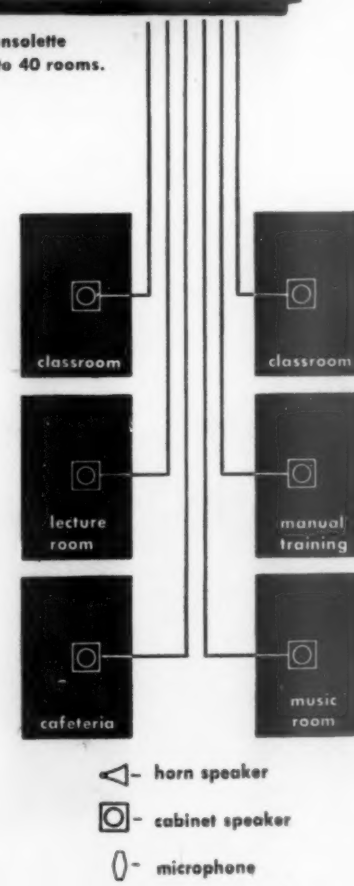
It is unique in design, amazingly simple to operate. No sprockets to thread or tear film. Neoprene rollers gently push film through carrier. 150-watt lamp. Coated lenses. Sufficient illumination for both black-and-white and color filmstrips and slides. You can run film forward or backwards. The simplest dual-purpose projector ever offered to the educational field.



RCA Consolette
SCHOOL SOUND SYSTEM

A Centralized System for use in Junior, High or Elementary Schools

Diagram shows typical installation of RCA Consolette Sound System. This equipment will serve up to 40 rooms.



This RCA centralized sound system offers a modern, efficient method of co-ordinating and controlling the school as a unit. It provides a simple means for quick, easy distribution of official announcements, radio programs, phonograph recordings and on-the-scene vocals to any or all rooms of a school or school grounds.

The control Consolette and microphone may be placed on a desk or table in the principal's office or centrally located in the school building, with loudspeaker outlets in the classrooms, gymnasium, auditorium, etc. Thus, it is possible for the school administrator or any other person to address the entire school body or any part thereof from one location. Optional equipment can be provided which permits two-way conversations between classroom and microphone locations (talk-back feature). Turntables are available which will play standard phonograph recordings and transcriptions.

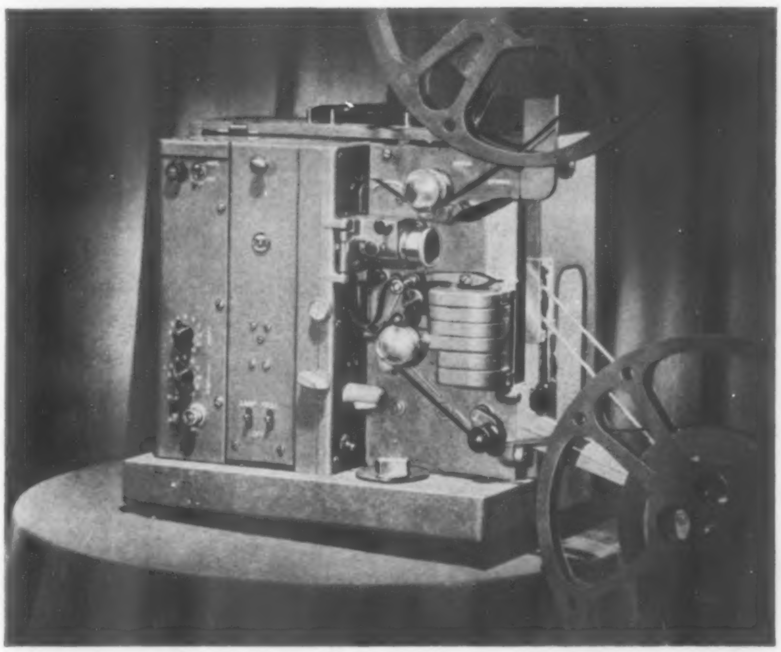
RCA offers Sound Systems to meet requirements of any School

RCA plans and engineers sound systems for all types and sizes of schools—from the smallest school to large high schools or universities. Write for complete details.

Sloping front cabinet speaker, for wall mounting, fills classroom with high-quality reproduction of voice or music.

the new RCA "400"

lighter weight ALL PURPOSE 16mm projector



With the RCA "400" you show educational films at their best in brilliance, contrast and definition. Easy portability makes it an ideal 16mm projector for use in classroom or auditorium in school or college.

The RCA "400" is the easiest of all sound projectors to thread and to operate. The precision sound scanning and speaker systems reproduce music and voices with the realism of natural sound. You change from sound to silent operation by merely turning a knob.

It is backed by RCA—the organization responsible for developing the finest in professional sound film recording and theatre projection equipment. See it . . . Hear it . . . with your own films.

The RCA Victor Classroom Phonograph

Designed specially for schools. Offers console-instrument performance in a record reproducer, table model in size.

This RCA classroom Victrola phonograph (Senior Model 66ED) makes it possible for educators to replace outworn prewar equipment with a low cost specialized instrument with high-quality reproduction.

It plays 12-inch or 10-inch records. Has "Golden Throat" tone system. "Silent Sapphire" pickup. Separate bass and treble tone controls. The instrument is attractively housed in a blonde finish walnut cabinet with closed back. Hand holes for convenience in carrying. Powerful amplifier provides sufficient volume for most auditoriums.

"Victrola"—T. M. Reg. U. S. Pat. Off.

RCA WIRE RECORDER

A convenient, economical and practical aid to teaching. It makes possible on-the-spot recording and immediate playback.

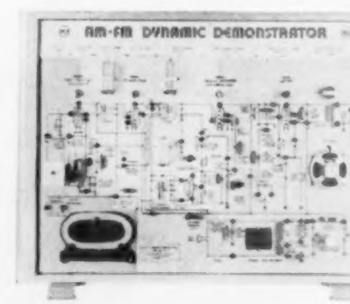
Revolutionary recording cartridge—exclusive to RCA—eliminates complicated threading of wire. Just plug in the cartridge, turn on the power, and record or play. Recordings can be played back hundreds of times. Weight less than 25 lbs.

Colleges, high schools and elementary schools will find it ideal for music and speech classes, foreign language study, dramatic presentations, assembly programs and special events.

RCA TEST and LABORATORY EQUIPMENT

RCA provides a wide variety of electronic test and instructional equipment for radio and electronic testing, measuring, and instruction.

RCA also manufactures the famous RCA Electron Microscope for high school and college laboratory research and instruction.

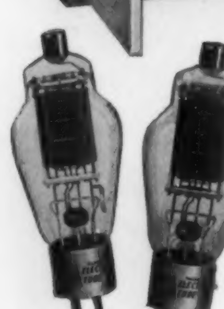


RCA FM BROADCASTING EQUIPMENT

FM provides educators with a new method for extending education within the school system, for adult education, public relations and home listening.

RCA's popular "Direct FM" 250-watt transmitter, type BTF-250A (illustrated), has everything schools and colleges need for outstanding performance, operating convenience and economy.

RCA's complete line of broadcast equipment includes everything for AM, FM and Television—from studio equipment to antenna and classroom receivers.



RCA ELECTRON TUBES

Every tube type you need for reception or transmission of radio or television. Special purpose types for many applications.

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An authoritative work book and reference manual on sound systems. Typical plans and specifications for sound systems for all types of buildings. Ideal text book for schools of architecture and engineering. Valuable for school library. Aids administrators in selecting correct sound systems.

Ask for complete information on your particular requirements.
Write: Educational Sales Department, 2, RCA, Camden, N. J.

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Amprosound "Premier-20" 16mm. Sound Projector

the AMPRO line

Precision Projectors of professional quality

The name "AMPRO" on any projector is your assurance of efficient operation . . . simplified, convenient controls . . . rugged construction . . . and long, satisfactory service.

Proof of this is in the remarkable performance record established by Ampro projectors during the past two decades in leading school systems, universities, top industrial concerns, churches, many branches of government service and in private homes all over the world.

The Ampro organization has the production and engineering facilities plus the practical experience to make some of the world's finest precision projectors. Before deciding on any projector—for any purpose—be sure to find out what Ampro has to offer you.

Ampro "Imperial" 16mm. Silent Projector

Send for Circular

. . . on Ampro models in which you are interested. Also send 10c for 16-page booklet, "The Amazing Story of 16mm. Sound Motion Pictures." It dramatically illustrates the various steps in the recording and reproducing of sound on film. Of special interest to students, teachers, sales executives, librarians, and 16mm. movie fans.

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Amprosound Model "AA" 16mm. High Intensity ARC Projector

Amproslide 2" x 2" Projector Model "30-A"

Amproslide Dual Purpose Projector Model "30-D"

A General Precision Equipment Corporation Subsidiary

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Buffalo 15, New York

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SPENCER DELINEASCOPES For All Teaching Problems

OPAQUE DELINEASCOPES

With these instruments photographs, maps, pupil's work, clippings, and innumerable small objects may be combined with slides, slidefilms, and microslides to form effective teaching units. Even in the largest classrooms they provide clear, brilliant images.

A CONSTANT STREAM OF AIR PROTECTS THE MATERIAL. The universal, motor-driven fan is controlled with a variable rheostat.

INSTANTLY CHANGED FROM OPAQUE TO LANTERN SLIDES. Merely turn handle, bulb remains stationary.

EASY TO CARRY. With two low-placed handles in front and rear, the 35 lb. Model VA can easily be moved by any teacher.

SUPPORTED AT FRONT ONLY. Back and sides are open to permit insertion of large books and periodicals.

LARGE 6" x 6" OPAQUE APERTURE. Projects six inch square area of large specimens.

SELF-LEVELING PLATEN. Prevents fuzzy images by maintaining proper alignment of material.

OPAQUE AND LANTERN SLIDE IMAGES COINCIDE at 20 foot projection distance.

ADAPTABLE for various screen sizes and projection distances by choice of lenses.

MODEL V

For opaque objects only. Easily adapted to glass slides, microslides, and slidefilms with added accessories

Manufacturers of the **SPENCER** *Scientific Instruments*

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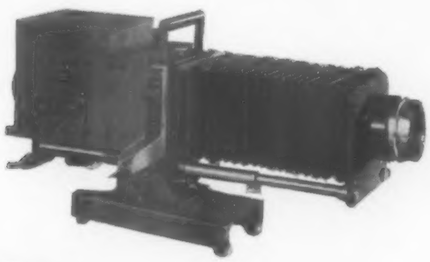
MODEL GK COLORSLIDE DELINEASCOPE

A Delineascope that provides sufficient brilliance for large auditorium use. It safely projects 2" x 2", 2¾" x 2¾", or 3¼" x 4" color slides with lifelike beauty. Light intensity control by iris diaphragm meets all room conditions. Slide protection is assured by an ingenious cooling system, including a rheostat-controlled motor-driven fan and a heat filter. Interchangeable condenser systems concentrate the light properly for large or small sized slides. New slide carrier has automatic centering and Lucite slot illuminator.

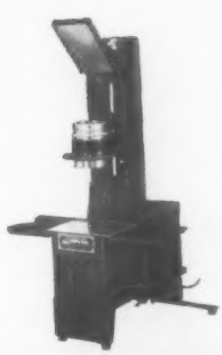


MODEL D LANTERN SLIDE DELINEASCOPE

A Delineascope designed for classroom projection of 3¼" x 4" lantern slides. For teaching convenience it provides non-heat-conducting handle, elevating and tilting device, side aperture to illuminate manuscripts, well designed optical system to insure sharp, brilliant pictures. It also has the new slide carrier with automatic centering and Lucite slot illuminator.

MODEL MK3AC MINIATURE SLIDE DELINEASCOPE

An improved 2" x 2" colorslide Delineascope for classroom or small auditorium. Efficient optical system has all surfaces AMERICOTED, including the newly designed f/3.75 objective—producing clear, brilliant images. Spiral focusing device is rapid and precise. New slide carrier automatically centers all types of slides, eliminates refocusing. 300 watts. Fan cooling unit keeps slides and equipment safe.



MODEL B SCIENCE DELINEASCOPE

A Delineascope which may be operated from the desk or lecture table. It projects a large, clear image onto a screen placed behind the instructor. The entire class can watch biology and physics experiments performed on its horizontal projection platform. Also projects 3¼" x 4" slides, translucent specimens in Petri dishes, and silhouettes of small objects.

MODEL VA

For opaque objects and lantern slides. Slidefilm and microslide accessories may be added

MODEL VAC

For every type of still projection material—opaque, lantern slide, slidefilm, microslide, and miniature slide

Manufacturers of the **SPENCER** *Scientific Instruments*

BAUSCH & LOMB OPTICAL COMPANY

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B BALOPTICON *—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality. It can be fitted with optical systems adapting it to a wide range of projection distances. Maximum illumination. Extremely simple to operate. Strip film, micro-projector and overhead projector attachments are available.

Model BDT is the same instrument as the B, but with a sturdy, tilting base, adjustable in two meridians. It permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.

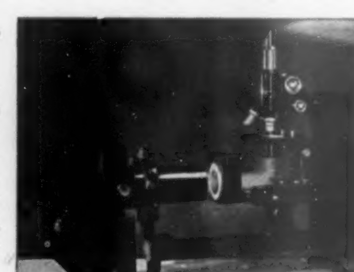
* Reg. U. S. Pat. Off.

B&L 2" X 2" SLIDE PROJECTOR

Manufactured to the high standards of performance that characterize all Bausch & Lomb projection equipment, the performance of the B&L 2" x 2" Slide Projector is characterized by brilliant, crisp, sharply defined screen images plus comfort, safety and convenience in operation. Shows black and white or color transparencies. An ideal instrument for projecting slides made by the instructor or by the students themselves.

This instrument is substantially made and is fitted with a high efficiency Bausch & Lomb optical system. This consists of a 150 watt, single contact base bulb with a silvered, concave reflector, a triple lens condenser, one lens of which is heat absorbing, and a five-inch f/.3.8 B&L Projection lens. Slide carrier permits use of cardboard, metal or glass mounted slides.

MODEL B MICRO-PROJECTOR



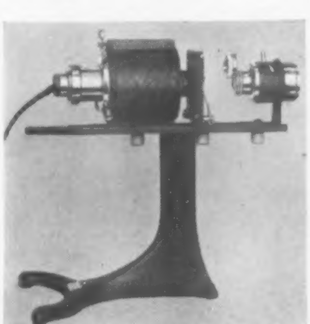
The Model B Micro-Projector fills teaching needs in many fields. Any department where a compound microscope is used, by the addition of this instrument, can enjoy the advantage of efficient and economical micro-projection.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this instrument before completing your plans for science laboratory development.

LRM AND ERM BALOPTICONS *

The LRM Balopticon for lantern slides and opaque objects gives brilliantly sharp screen images under actual classroom conditions. An improved Built-In Blower-Cooling System efficiently safeguards objects being projected. The improved object holder is entirely free from interfering obstructions and permits projection of 6"x6⅜" areas of large maps, drawings or photographs. The door is arranged for convenience in placing solid objects in the projection area. The ERM Balopticon is similar, but equipped only for opaque projection.



TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes: (1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.

BALOPTICON TABLE

The B&L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

* Reg. U. S. Pat. Off.

SEND FOR CATALOGS

Catalog E-11 "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subject of Catalog E-20. For information on Bausch & Lomb Microscopes and Spectrographs see pages 554, 555 of this book.

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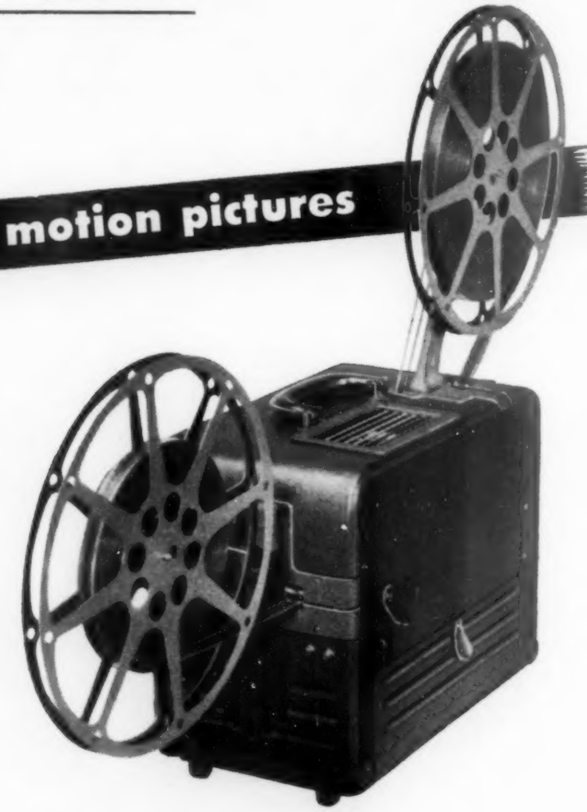
For superior motion pictures



Designed and built by the makers of Hollywood's preferred professional equipment

There is no secret about the professional quality of Filmo visual aids . . . motion pictures and slides. Filmo cameras, projectors, and accessories are precision-built by the makers of Hollywood's preferred professional equipment.

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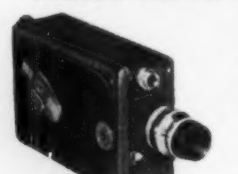
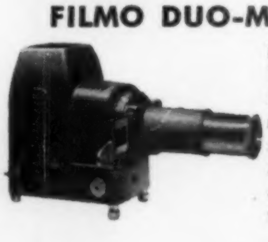


This 16mm camera loads in an instant—just slip in the magazine of film. Five operating speeds; makes animated cartoons, too. Built-in guide tells how to set the Filmocoted lens for any outdoor condition.

FILMO 70-DA CAMERA

The 16mm camera that gives you truly professional results with amateur ease. Three-lens turret head, with Filmocoted lenses, permits instant change from one lens to another. Seven film speeds.

FILMO DUO-MASTER PROJECTOR



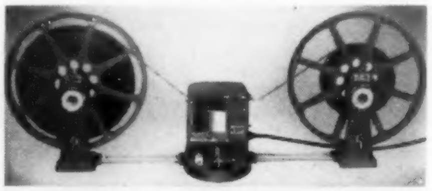
Shows 2″ x 2″ slides with even brilliance. Color-balanced heat filter for *true* values in color slides. Permanently precise alignment of optical system, 300-watt illumination, Filmocoted lens. Slides are fully protected from heat.

B & H FILM DEFECT INDICATOR

Completely new—for rapid, thorough inspection of 16mm film perforations. Warning light automatically flashes to indicate damaged perforation. Can be set up "in series" with the Filmotion Editor.

FILMOSOUND PROJECTOR

Filmosound-projected 16mm motion pictures are assisting thousands of teachers to instruct effectively the largest classes in American school history. Uniformly brilliant pictures, rock-steady and flicker-free. Truly natural sound at all volume levels. Simple to use, mistake-proof, lastingly dependable.



FILMOTION EDITOR

Viewer, Splicer, and two heavy-duty Rewinds. Draws 16mm film through a scratch-proof channel. Pictures appear as miniature movies, sharp and clear. Exclusive diagonal splicing is fast and accurate.

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For descriptive literature on this and other Bell & Howell equipment, write Bell & Howell Company, 7150 McCormick Road, Chicago 45. Branches in New York, Hollywood, Washington, D.C., and London.

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Since 1907 the Largest Manufacturer of Professional Motion Picture Equipment for Hollywood and the World

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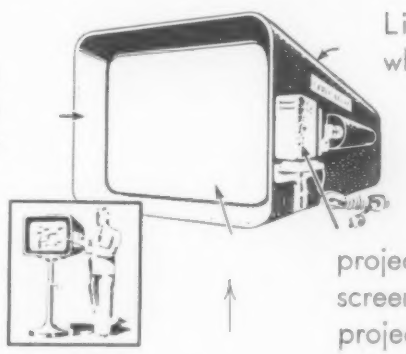
The NEW *Army Proved* Patented COLLESCOPE

Save Buying Darkroom Shades—Show Your Films In All Rooms!
CARRY YOUR DARKROOM WITH YOU!

Four-Sided Screen Hood Brightens Image Wider Angle of View



Light, Streamlined box, which hoods projector beam

Adaptable to any 16 or 35 mm projector! Instructor stands BESIDE screen FACES class as he operates the projector—thus being able to point out details on the screen . . . the IDEAL TEACHING situation!

A strong image is projected on a translucent screen—caused by transmitted light through the THIN screen.

MODEL B COLLESCOPE

On casters for easy movement around schools, factories, offices, etc. Adaptable to any 16 mm or 35 mm projector—shows under lighted conditions—Strong 35" x 30" image.

SAVES HAVING TO CARRY HEAVY SCREEN AND PROJECTOR—Saves time going to and from a darkroom!

CARRY all-important professionally built 16 mm or 35 mm movies and still films to groups—allows healthier conditions with more ventilation and light in the room for taking notes!

MODEL A COLLESCOPE

Easily moved by handle—only 15 pounds, shows movies, or 35 mm stills slides or strip films—
Box length—only 30 inches!

STRONG 28" x 26" image
Army-civilian classroom tested!

THESE DEVICES WERE DESIGNED AND USED IN THE ARMED FORCES FOR THE TRAINING PROGRAM—many schools, churches, factories and hospitals are now using these for training and recreational purposes!

Write direct to us or ask your photographic dealer for a demonstration

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THE LIGHTER-WEIGHT PROJECTOR YOU'VE DREAMED ABOUT IS HERE

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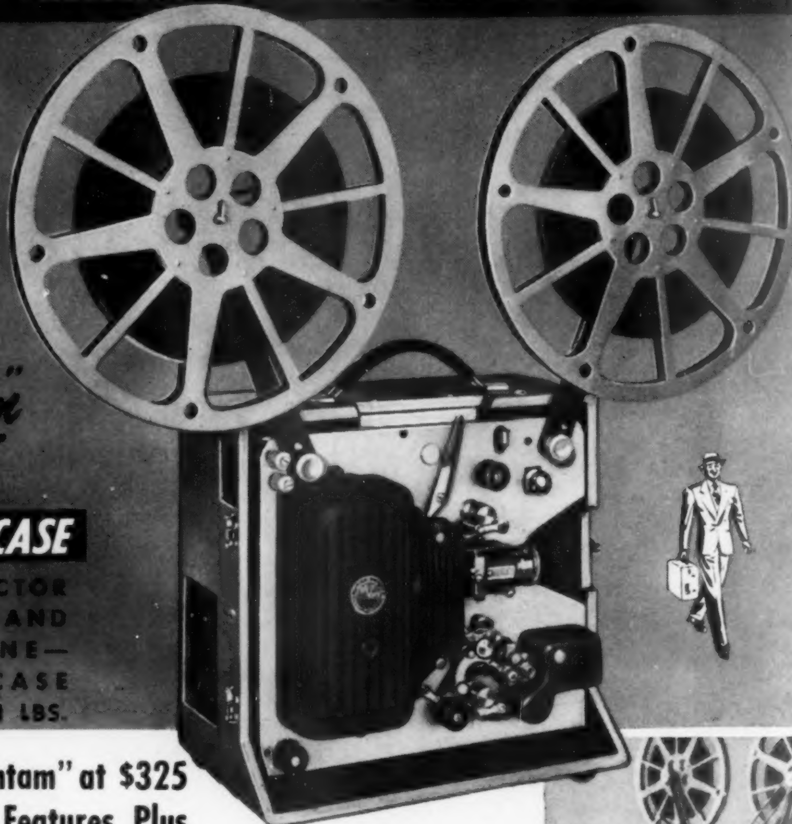
THE NEW DeVry "Bantam"

THEATRE-IN-A-SUITCASE

16mm. SOUND PROJECTOR AMPLIFIER, SPEAKER AND SCREEN—ALL-IN-ONE—SMALL, COMPACT CASE WEIGHING LESS THAN 31 LBS.



The New Under 31 lb. "Bantam" at \$325 Gives You BIG Projector Features Plus Many New Exclusive DEVRY Refinements

- ★ Brilliant, Flickerless Pictures
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- ★ 2000 ft. Film Capacity
- ★ 750-1000 Watt Illumination
- ★ Light Out-Put Exceeds 200 Lumens
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- ★ Automatic Loop Setter
- ★ Rotating Sound Drum
- ★ Prefocused Exciter Lamp
- ★ Simplest Film Threading
- ★ Instant, Positive Tilting
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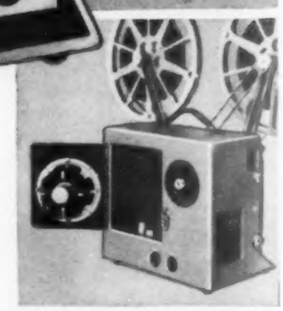
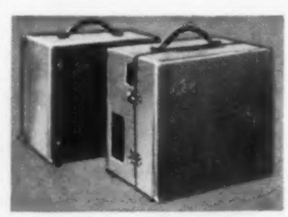
- ★ Motor Driven Forced-Air Cooling
- ★ Operation on Either AC or DC



Single Case "Bantam" with built-in 6-inch ALNICO 5 permanent magnet speaker, is readily detachable for placement at screen as desired.



Dual Case "Bantam," projector and amplifier in one case. 8" ALNICO 5 permanent magnet speaker in separate case. Only \$364.50

Your new DEVRY "Bantam" has adequate illumination (750-1000 Watt) for projecting brilliant pictures in auditoriums.

NOW - More than ever *Your best buy is a* **DEVRY**

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16mm. sound film projector

(with silent speed)

Features all of the full-scale characteristics of a professional-type projector in a small, compact, rugged-as-a-tractor machine that is especially built for sound.

for homes · schools · clubs · churches
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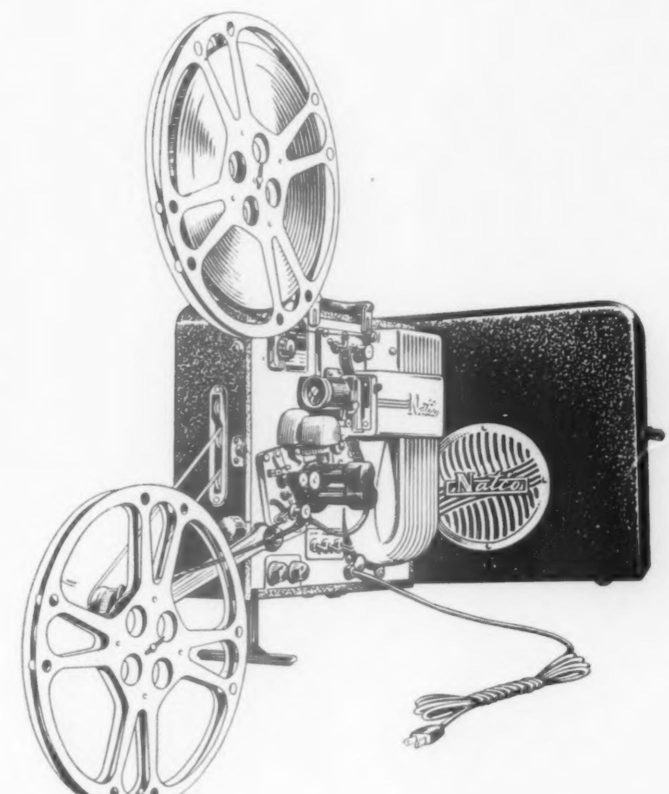

NO OTHER PROJECTOR OFFERS SO MANY HIGH QUALITY FEATURES

- **axial-flow cooling system**

Only Natco has it! Operates 200° cooler than conventional machines.

- **unsurpassed sound quality**
- **simple to thread**
- **easy to maintain and service**

here's why Natco is first in 16mm. projection

- **The ONLY axial-flow cooling system! (Quieter · Cooler · Compact)**
- **The ONLY 8" P.M. speaker at the price!**
- **The ONLY 5-watt amplifier at the price!**
- **No converter necessary, AC-DC 105-125 volt, 50 or 60 cycle**
- **Up to 2000 ft. film capacity**
- **750-watt lamp (1000-watts can be used)**
- **2-inch F 1.6 coated lens**
- **Frequency range 30 to 10,000 cycles**
- **Microphone and turntable attachment optional**
- **Projector only, with reel arms 28 lbs.**
- **Total weight—37 lbs. (Projector and Speaker in one case)**
- **Underwriters Laboratories approved**

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THE VICTOR LITE-WEIGHT

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- SINGLE UNIT CASE
- SIMPLE TO OPERATE
- COMPACT
- ECONOMICALLY PRICED

Because of its compactness and easy portability VICTOR'S amazing New Lite-Weight provides new uses and greater versatility in 16mm. Encased in aluminum with attached speaker, the Lite-Weight retains the famous Victor quality features.

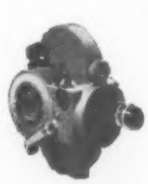
THE VICTOR TRIUMPH 60

For Larger Audiences and Auditorium Use

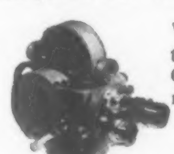
The Triumph 60 continues to be the most popular 16mm Sound Motion Picture Projector for large gatherings, indoors or outdoors Speaker is in separate case and may be located in spot best suited to acoustics of room or hall. All Victor Projectors provide sound and silent speeds, reverse and still projection.

Victor Cameras

UNEQUALLED IN THE 16mm FIELD



Victor Model 3, . . . an outstanding camera at a moderate price.



Victor Model 4 . . . For the advanced amateur. Quickly adjusted turret mounted lenses.

Victor Model 5, an ultra-refined camera with REVERSE ACTION. For those whose specialty is trick photography.

THE NEW *Sonomaster*

The Ultimate in Record Players — assuring flawless performance in playing records and transcriptions.

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OPERADIO MANUFACTURING COMPANY

St. Charles, Ill.

SOUND SLIDEFILM PROJECTORS

OPERADIO

INTERCOMMUNICATION EQUIPMENT

OPERADIO
EXPLAINETTE
"EDUCATOR"
Sound Slidefilm Projectors

- FOR CLASSROOM INSTRUCTION
- FOR PUBLIC ADDRESS WORK
- FOR PLAYING RECORDINGS OR TRANSCRIPTIONS

Audio-visual education is the most effective and versatile teaching aid available today. Statistics have proved that there is more interest stimulated in the subject being taught . . . that the student learns and absorbs information faster . . . and in addition retains knowledge of the subject much longer when sound slidefilms are used as a medium of instruction.

The Explainette "Educator" is an outstanding unit in every respect and incorporates many specific features, which make it the most versatile unit of this type for all school activities.

Write OPERADIO MANUFACTURING COMPANY, ST. CHARLES, ILLINOIS
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CHECK THESE OUTSTANDING FEATURES

- High fidelity OPERADIO 12 watt amplifier, with less than 5% distortion at full output.
- OPERADIO 8" speaker for finest total qualities.
- Plays 78 RPM recordings or 33⅓ RPM up to 16".
- Facilities for mixing microphone with background music.
- Available with or without S.V.E. Model "AAA" or "G" projector.

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. . . Talk Instantly . . .

Save Time . . . Save Steps

with **FLEXIFONE**

OPERADIO MANUFACTURING COMPANY

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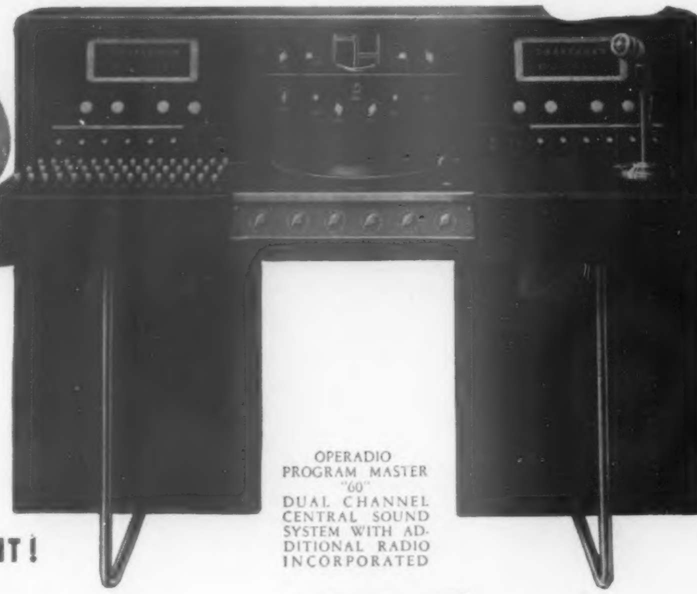
CENTRAL SOUND CONTROL SYSTEM

OPERADIO

LOUDSPEAKERS AND BAFFLES

OPERADIO PROGRAM MASTER CENTRAL SOUND CONTROL SYSTEM



OPERADIO PROGRAM MASTER "60" DUAL CHANNEL CENTRAL SOUND SYSTEM WITH ADDITIONAL RADIO INCORPORATED

• A COMPLETE AND FUNCTIONAL SYSTEM . . . ENGINEERED AND BUILT TO MEET EVERY SCHOOL REQUIREMENT!

An efficient, flexible school sound system is an important factor in complementing the modern teaching methods of today. The "Program Master" is centrally located with loudspeaker outlets in each class room, in the auditorium, in the gymnasium, in the cafeteria, etc. It is possible to address or distribute radio or phonograph programs to any selected room, group of rooms or the entire school body. The "Program Master" is available in two models . . . a dual channel console for schools from forty five to ninety rooms . . . a single channel consolette for schools from fifteen to forty five rooms.

The "Program Master" greatly broadens the education of the student in history, music, languages, literature, dramatics, public speaking, etc. The EMERGENCY SWITCH is actually a necessity for the protection of students and personnel in case of fire or some other accident or catastrophe.

CHECK THESE OUTSTANDING FEATURES

- Individual Speaker Selection For Each Speaker In System
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- Dual Speed Transcription Player
- Emergency Switch To Control All Speakers
- Two Way Intercommunication
- Program Selector and Control For Selecting and Mixing More Than One Program Source

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Streamlined, modern cabinets of durable die-cast metal. Smooth, attractive gray-tan Hammerloid finish compliments any desk. Self-clearing piano-action keyboard — no chance of transmitting message to two persons, unless you wish to do so. Plastic station-selector keys with easily read name tabs. Talk Bar controls conversations — special lock-down feature holds bar in "talk" position when required. Plastic on-off switch and volume control knobs. All models designed and engineered for highest quality performance.

Write **OPERADIO MANUFACTURING COMPANY ST. CHARLES, ILLINOIS,** *For Complete Information*

LAFAYETTE-CONCORD SOUND SYSTEMS

100 SIXTH AVENUE, NEW YORK 13 • 110 FEDERAL STREET, BOSTON 10 • 24 CENTRAL AVENUE, NEWARK 7 • 901 W. JACKSON BLVD., CHICAGO 7 • 265 PEACHTREE STREET, ATLANTA 3 • 542 EAST FORDHAM ROAD, BRONX 58 • 229 W. MADISON STREET, CHICAGO 6 • 849 MERCER STREET, ALLENTOWN, PA.

NOW EVERYTHING IN SOUND FROM ONE GREAT SOURCE

You will make the pleasant discovery, in working with Lafayette, that the most suitable sound system for your school's particular requirement may not necessarily be the most *expensive* one. This is a particularly good thing to know when you are required to fit high sound standards within the framework of a close budget.

We serve as sound consultants for a large number of prominent schools, who have found that it pays to deal *direct* with the largest radio supplier in the world. Our extensive buying power, huge stocks and complete engineering facilities inevitably result in a saving for you of both time and money. If you are contemplating any installation of sound equipment—no matter how large or small—you will find it profitable to call on Lafayette. Our staff of consultants will be glad to assist you, without obligation. Just call or write the Lafayette office nearest you.

Lafayette Concord

OUTDOOR SYSTEMS
for stadia, playfields

•

INDOOR SYSTEMS
auditorium, gym, etc.

•

CENTRALIZED SCHOOL SYSTEMS

•

INTERCOMMUNICATING SYSTEMS

•

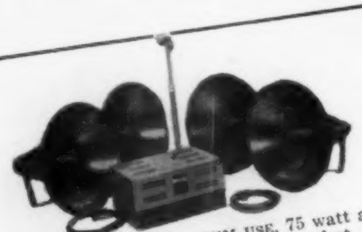
PROFESSIONAL RECORDERS

•

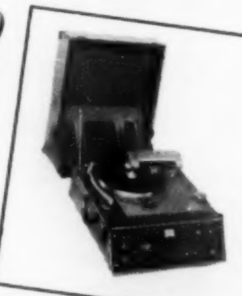
WIRE RECORDERS

•

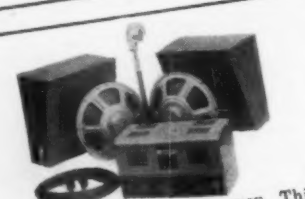
HIGH FIDELITY MUSIC SCHOOL SYSTEMS



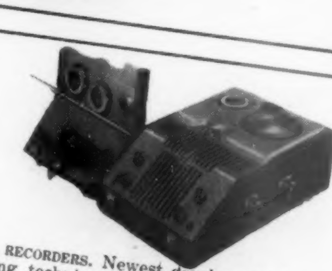
FOR OUTDOOR AND STADIUM USE. 75 watt amplifier covers up to 70,000 square feet. All components, including tubes and cable, for only $275. Other combinations available.



PROFESSIONAL RECORDERS where critical fidelity is desired. Select from a wide assortment ranging in price from $110 to $550. Ideal for music classes, choirs, etc.



FOR INDOOR AND AUDITORIUM USE. This 25 watt system is typical of Lafayette values. Sufficient for an audience of 3,000, it is delivered complete, ready-to-work, for only $175.



WIRE RECORDERS. Newest development in recording technique. Prices start at $159.50 for popular models. A full hour's proceedings can be easily recorded on one re-usable spool.

CENTRALIZED SCHOOL SYSTEMS. Increasingly popular for multi-purpose usage. Cover classroom hook-ups, music and dramatic equipment, radio phonograph attachments, etc. Prices for complete systems start at $500.

INTERCOMMUNICATION SYSTEMS from two stations to 100-station hook-ups. Price for a two station set, including tubes, 50' of wire, plastic cabinets, etc., is only $12.95 delivered.

WRITE FOR FREE CATALOG AND INFO ON OTHER EQUIPMENT

Students using specially developed Lafayette equipment follow their operatic scores while listening to recordings on a Lafayette custom installation. A similar system is being used by the famous JUILLIARD SCHOOL in New York.

CUSTOM MUSIC SYSTEMS
can be designed and engineered at a price to suit your budget. Lafayette custom-builds these high-fidelity systems for America's music, dramatic and radio schools. They incorporate the most modern developments in high-fidelity recording and playback. Our engineers will send you suggestions and estimates based upon your needs.

WEBSTER ELECTRIC COMPANY

Racine, Wisconsin, U. S. A. Established 1909.

"Where Quality is a Responsibility and Fair Dealing an Obligation"

Export Department: 13 E. 40th Street, New York 16, New York. Cable Address: "ARLAB" New York City

School Sound Systems that meet the needs of large or small schools

• • •

built to meet your requirements . . . install part now and add to system as your budget allows!

With the Webster Electric school sound system you can install a basic system and at a later date add to it. This offers an opportunity to schools with limited budgets. Webster Electric offers a choice of services as listed below, in addition to a choice of single or two-channel systems. The two-channel system makes it possible to distribute two programs at the same time.

In addition, an intercommunication system can be incorporated between principal's office or class rooms. This makes it possible to communicate with teachers in any room in the building. A silencing feature prevents monitoring of class rooms without the teacher's knowledge.

The sound system offers the following facilities:

1. **Record Changer**
2. **Paging Microphone**
3. **AM-FM Radio Receiver (1 or 2)**
4. **Program Microphones**
5. **Time Signal**
6. **Intercommunication**
7. **Transcription Turntable**

The Webster Electric School Sound System offers an opportunity to modernize your school system with sound. For full information write Webster Electric Company, Racine, Wisconsin.

Licensed under U. S. Patents of Western Electric Company, Incorporated, and American Telephone and Telegraph Company.

WESTERN SOUND AND ELECTRIC LABORATORIES, INC.

805 S. Fifth Street, Milwaukee 4, Wis.

Custom-Built **TO YOUR NEEDS . . .** Model B

READY FOR NEXT SEMESTER'S USE

You can be certain of the latest and finest of Sound Distribution facilities—to take advantage of modern teaching and program techniques—with a Custom-Built WESTERN System.

The Senior Model B illustrated, designed to exacting school specifications by experienced WESTERN engineers, embodies all the important new developments in sound engineering. In its beautiful walnut-grained, all steel desk-type cabinet you'll have:

Custom-built FM and AM radio tuner—built-in dual speed electric phonograph handling up to 16″ records—10″ monitor speaker—separate talk-back amplifier and speaker—automatic volume control—fingertip classroom controls for up to 50 rooms—and many other features. Complete, compact, with power output up to 100 watts, measures only 46″ wide, 39″ high, 24½″ deep.

Western Sound has 4 other types of Centralized Systems to choose from. Models contain from 20-100 classroom switch and can be supplied with amplification of 25 watts to 250 watts.

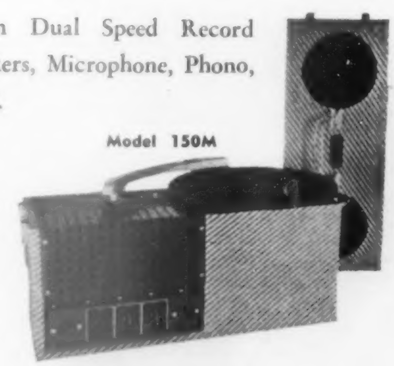
New Portable 10 watt

PUBLIC ADDRESS SYSTEM

with

- 16″ Transcription Dual Speed Record Player, Dual Speakers, Microphone, Phono, and Tone Control.
- High Fidelity.
- 60-1400 cycles.
- Plywood Case.
- 5 Tubes.
- Low cost.
- Polarized Connections.

Model 150M



READY FOR IMMEDIATE DELIVERY

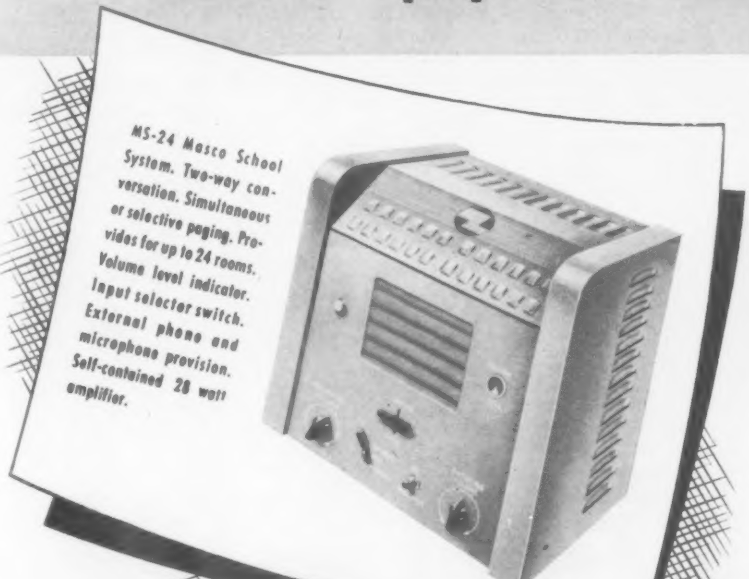
All sizes of WESTERN'S new 1948 Portable Sound Equipment, including Recorders, Record-player combinations, and public address systems. Write for literature and name of your nearest WESTERN School Distributor.

MARK SIMPSON MFG. CO., INC.

32–28 49th Street
Long Island City 3, N. Y.

MASCO SOUND SYSTEMS

Wherever Sound is Amplified or Reproduced MASCO Equipment Does it Efficiently



MS-24 Masco School System. Two-way conversation. Simultaneous or selective paging. Provides for up to 24 rooms. Volume level indicator. Input selector switch. External phone and microphone provision. Self-contained 28 watt amplifier.

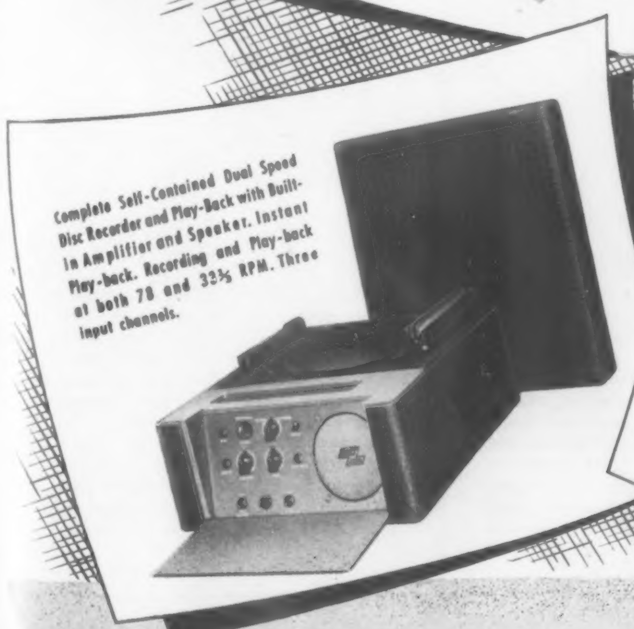
All Equipment Underwriters' Laboratories Approved

The more modern the school, the wider its use of MASCO Sound Equipment . . . for simultaneous paging in all classrooms . . . for intercommunication . . . for public address work in assembly and lecture hall, in the stadium, on the playing field . . . for recording and playing back speech and music . . . and many, many more applications.

MASCO is the recognized leader in ready-assembled sound equipment. Quality components, superb engineering and highest craftsmanship are combined in MASCO Sound Systems to give fine service and long life.

PORTABLE AND FIXED AMPLIFIER SYSTEMS
FROM 8 TO 75 WATTS OF POWER
PHONO-TOP AND RECORD-CHANGER TOP AMPLIFIERS
INTERCOMMUNICATION SYSTEMS
RECORDERS AND PLAYBACKS

For further information write directly to the factory or see the Masco distributor nearest you.



Complete Self-Contained Dual Speed Disc Recorder and Play-Back with Built-In Amplifier and Speaker. Instant Play-back. Recording and Play-back at both 78 and 33⅓ RPM. Three input channels.

Masco 35 Watt Amplifier. One of the many in the complete Masco line of amplifiers from 8 to 75 watts for portable and fixed sound systems, for both indoor and outdoor use.

AMERICAN SEATING COMPANY

Grand Rapids 2, Michigan

Manufacturer of School, Auditorium, Stadium, Theatre, Church Seating, and Folding Chairs

You get more for your money in American Seating Company's school furniture because improved production methods and manufacturing equipment bring about new economies with no sacrifice of quality. World leadership has been achieved by American Seating products through a policy of increasingly higher standards made possible by continuing laboratory research and testing, and rigid inspection procedures. In this way, "American" quality is safeguarded always, and you are assured long, economical service and lasting satisfaction.

AMERICAN UNIVERSAL DESKS

No. 434 Lifting-Lid Desk—Outstanding for comfort, sight conservation, posture, design, materials, finish and construction. The one - piece steel book - box with lifting-lid has rounded edges. Desk top is adjustable to sloped or level writing positions; non-slam friction control—no exposed moving parts. Cradle - formed seat is scientifically designed to make erect sitting comfortable, natural and less fatiguing. Self-adjusting lower back rail, and seat formed with no rearward elevation, fit every occupant.

Seat swivels 45 degrees each way to silent, cushioned stop. Frame has maximum strength and stability, with fluted foot-rest, solid metal gliders, and smooth-working, never-failing height-adjustment clamps. Sturdy, rigid, yet light and easy to move.

Desk top, seat and back are of strong plywood, bonded with hot-press, urea-resin adhesive. Provides maximum strength and moisture-resistance.

DIMENSIONS

Size	Grades	Seat Height	Desk Height	Total[1] Length	Desk[2] to Back	Seat Depth
C	I-III	11½-15½"	23-28"	29¾"	9¼ and 10¼"	10½"
B	II-VI	11½-15½"	23-28"	30¾"	10½ and 11½"	12¼"
A[3]	V-Adult	14 -18"	26-31"	31¼"	11¼ and 12¾"	14"

1. Near position. Seat swiveling requires 2" additional floor space.
2. Both spacings provided for in seat construction.
3. Size A equipped with X seat (15½ x 17½") is available as Size AA.

American Envoy Desk No. 362

The strongest, most comfortable and durable desk of its type ever built. The tubular support and never-failing clamp permit easy, efficient desk-top adjustment. Has roomy, sanitary book-storage cabinet. Deep-curved back rails promote comfort and good posture. Self-adjusting lower rail mounted on silent pivots. Top, seat and back of hot-press plywood, bonded with urea-resin adhesive. Has hardened-steel, rubber-insulated gliders. In three seat heights 13", 15" and 17".

American Folding Chair No. 44

Popular-priced chair with remarkable built-in values of great strength, durability and comfort. For general use, including dormitories. Seat is shaped from 5-ply urea-resin-bonded plywood with rounded edges — walnut stained and lacquered. Reinforced steel frame and back panel, beige enameled and baked. Main frame is reinforced for added resistance to wear. A rear-posture folding chair with smooth, clean lines and freedom from catching and pinching hazards.

American Bodiform Auditorium Chair No. 12-001

Combines modern, streamlined beauty with maximum comfort and more room for sitting and passing at standard spacing. Automatic seat-fold action with completely self-adapting hinge construction. No pinching or tearing hazards. Upholstery is quickly, easily replaceable. Provides greater economies of maintenance, space and service. Other auditorium chairs available with plywood back and seat, or upholstered types. Write for complete information.

AMERICAN SEATING COMPANY

Grand Rapids 2, Michigan

Manufacturer of School, Auditorium, Stadium, Theatre, Church Seating, and Folding Chairs

All American Seating Company desks, chairs and tables are available with wood parts finished in No. L-48 Standard School Brown. Also available in No. L-31 Natural Finish, with 35 to 50 per cent light reflectance. All metal parts are dipped in No. 286 Beige Enamel and baked to a smooth hard finish.

AMERICAN UNIVERSAL TABLES

All-Purpose Tables Attractive and Serviceable

In the fine-furniture class but at school-budget prices, American Universal Tables are truly remarkable values. Top is heavy cored-plywood construction (hot-pressed and urea-resin-bonded), protected and reinforced by perfectly joined-and-mortised hardwood framing; superior to solid-wood construction of equal thickness, and offers incomparably greater resistance to warping, checking, splitting or other deterioration. No corner legs or other structural parts to interfere with knees or limbs. No weak glue joints to get loose. Graceful standards provide strength to withstand the hardest use. Finished with durable, high-grade lacquer.

Size illustrated: 36 x 72", 29" high

Available in the following sizes of top: 24 x 48", 30 x 60", 30 x 72" and 36 x 72". Each top size is available in the following heights: 20", 22", 24½", 27", and 29". Strong plywood book compartments optional on one or both sides in all sizes. For use in dormitories, libraries, cafeterias, offices, classrooms, etc.

American Universal Tablet-Arm Chair No. 471

University type chair in graceful design and soft-toned coloring that harmonizes with any architectural style. Solidly constructed for generations of severest use with minimum maintenance. Deep-curved back with self-adjusting lower rail to fit all occupants. Seat, back and arm of hot-press plywood, bonded with urea-resin adhesive. Cradle-formed seat, 15½ x 17½"; height, 17". Tablet arm approximately 12 x 23½".

American Envoy Posture Chair No. 368

Classroom and dormitory chairs combining clean-cut functional beauty with perfect comfort and postural design. Light, strong, easy to handle. Rigid construction eliminates all squeaks and rattles, provides utmost strength at points of greatest strain. Lower back rail is noiselessly self-adjusting. Seat and back of hot-press, urea-resin-bonded plywood. Equipped with silent insulated steel gliders. 4 seat heights: 11", 13", 15" and 17".

American Envoy Tablet-Arm Chair No. 380

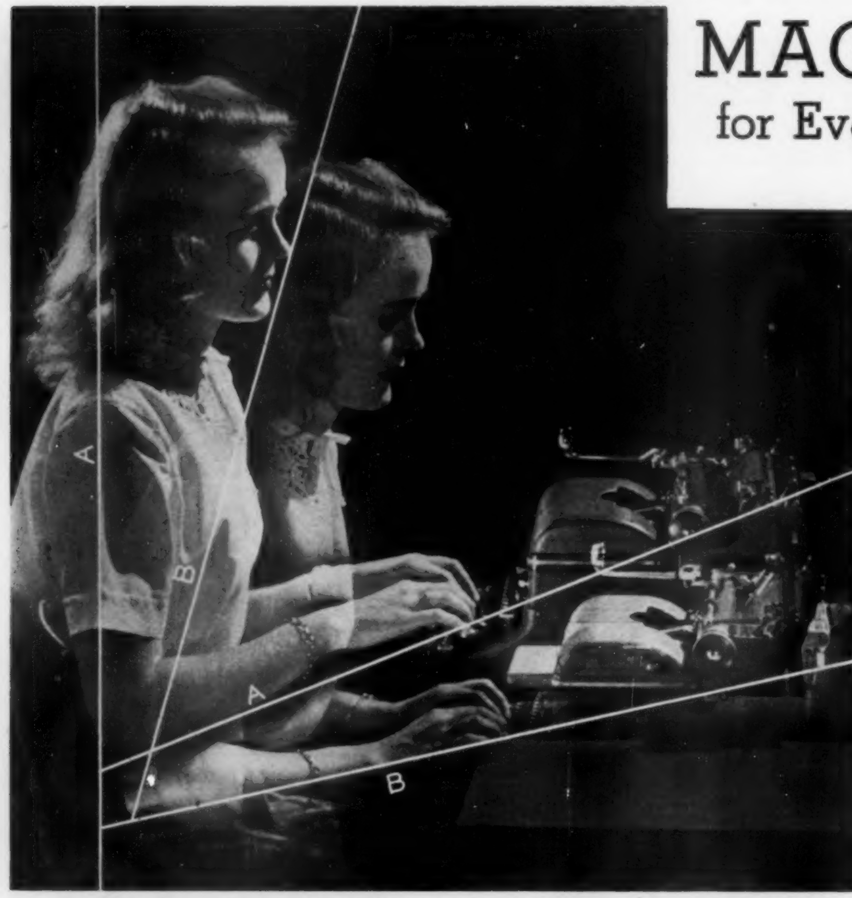
An unapproachable value in the low-priced tablet-arm chair field. New perfection in posture and comfort qualities are assured by deep-curved back with silent, self-adjusting lower rail, formed seat and 23½ x 12" tablet arm (slopes 3½" within its length). Seat, back and arm of hot-pressed, urea-resin-bonded plywood. Has sanitary, roomy book cabinet. Silent, cushioned gliders. Seat height, 17" only. (Also available without book cabinet—No. 378.)

HAMMOND DESK COMPANY

5248 Hohman Avenue, Hammond, Indiana

The New HARTNETT ADJUSTABLE DESK Assures the . . .

MAGIC ANGLE
for Every Typing Student



30°

Studies by training officers in the Federal Government show that the magic angle (30°) at the typewriter increases speed, reduces errors and fatigue. The illustration above shows how the typewriter at "B" height throws the student into a hunch; brisk stroke is impossible and fingers snag keys. For this particular student the typewriter should be at "A" height, giving the proper angle for less fatigue, fewer errors and faster progress. The new Hartnett adjustable desk can be easily adjusted to the correct height for any student.

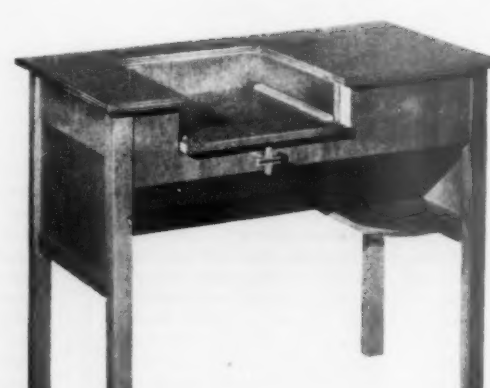
Solves Problem of Correct Typewriter Height. Upgrades 70% of Students

Repeated tests of the new Hartnett adjustable typing desk show immediate improvement in class work is effected. A simple patented device, located below the well as illustrated above, enables every student to adjust the typewriter to the correct height for the "magic angle." Of oak; 30" high, 20" wide, 36" long.

Some Features of This Advance-Type Desk

Send for the above bulletin for details of this revolutionary new desk.

- Increases efficiency and typing speed.
- More comfort; better posture; less fatigue.
- Less eye strain. Transcription copy is 4" closer than with commonly used 26" desks.
- Adjusted by the student to any height from 26" to 30".
- Front and sides enclosed for comfort of feminine students.
- Gives a business-office atmosphere to the class room.
- Only the typewriter is raised or lowered; the desk remains uniform.



HARTNETT DE LUXE CLASSROOM MODEL

HEYWOOD-WAKEFIELD COMPANY

666 Lake Shore Drive, Chicago, Illinois

FOR EVERY CLASSROOM NEED

As the selection shown here implies, there is a Heywood-Wakefield unit for virtually every classroom need. For this is a versatile line, designed in step with modern trends in classroom arrangement—and designed correctly to assure comfort and proper posture. Scientifically graded sizes eliminate the need for individual adjustment. The tested Heywood-Wakefield welding process assures true lifetime ruggedness to the tubular steel frames—and our finishes are noted for their fine appearance and durability.

Write today for our current folder illustrating and describing the complete Heywood-Wakefield line. It will be of real assistance in your planning for either the expansion or modernization of your installation. Heywood-Wakefield Company, 666 Lake Shore Drive, Chicago, Illinois.

HEYWOOD-WAKEFIELD
EST. 1826

School Furniture Division

Chicago, Illinois

THONET BROS., INC.

1 Park Avenue, New York 16, N. Y.

1698 Merchandise Mart, Chicago, Ill.
731 South Meeting St., Statesville, N. C.

FACTORIES: York, Penn.; Statesville, N. C.; Sheboygan, Wis.

FURNITURE THAT LASTS—

FOR OVER A CENTURY, Thonet Brothers have been leaders in the manufacture of fine furniture.
Thonet BENTWOOD furniture is generally recognized as being superior in strength, elasticity and durability.
Made of molded plywood under application of the most advanced production methods, Thonet BENTPLY furniture offers great power of resistance and a spring effect which makes for comfort.
Prominent schools, universities and colleges are using Thonet chairs and tables for assembly and study halls, libraries, reception rooms, offices, cafeterias, lunchrooms and dormitories.

BENTWOOD CHAIR

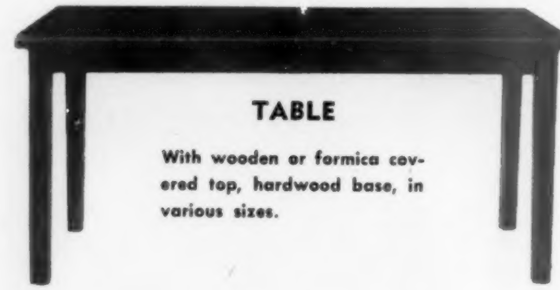
With bow support, made of bent hardwood.

BENTWOOD CHAIR

With bow support and back rails, made of bent hardwood.

BENTPLY CHAIR

With one piece front and back legs and curved back support, made of molded plywood.



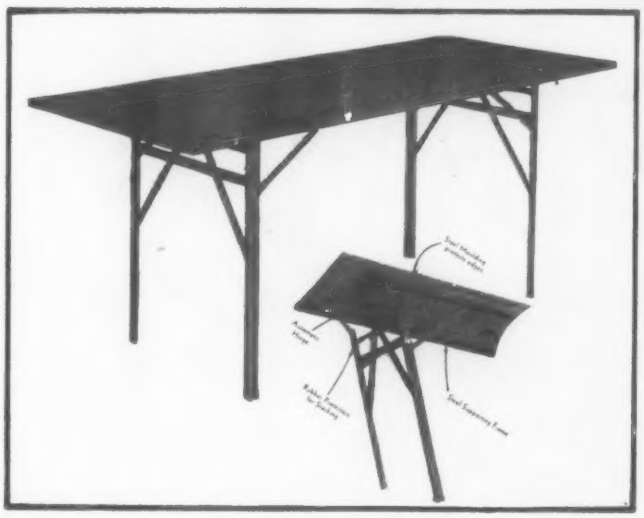
TABLE

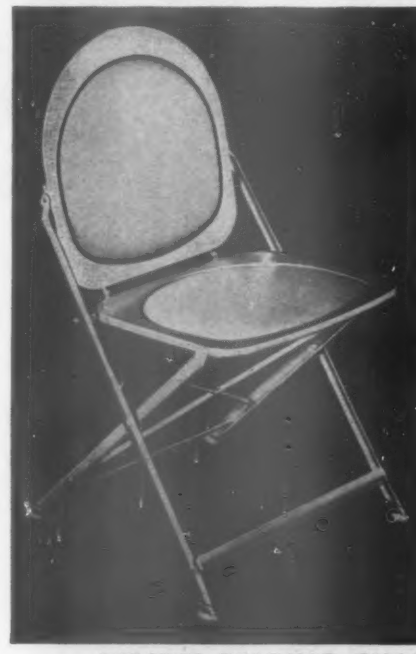
With wooden or formica covered top, hardwood base, in various sizes.

THE BREWER-TITCHENER CORPORATION

118 Port Watson St.
Cortland, New York

Hostess FOLDING PRODUCTS





ALL METAL FOLDING CHAIRS

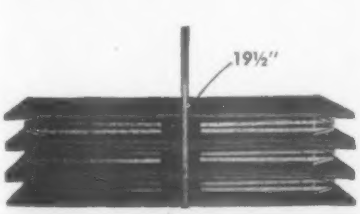
FOLDING BANQUET TABLES

The all-steel frame construction of the BTC Hostess table gives exceptional lightness with superior strength and rigidity. Frame and legs are made from 12-gauge steel. The legs are 1½″ x 1½″ and are finished in buff, with the frame in black enamel.

One person alone can quickly set up and take down the Hostess table — the simple, automatic, positive catch locks securely; the legs operate easily in units of two; and no special manipulation is required.

The tops are made from ¼″ brown, tempered Masonite with hot lacquer finish. All edges are protected with a formed steel moulding around the entire top.

Obtainable in standard size, 72″ long x 30″ wide x 30″ high. Packed two to a carton with shipping weight of 122 lbs.



Stacks 6 to 19½ Inches

DELUXE FOLDING CHAIRS

Hostess folding chairs introduced a new construction principle—a full seat, full back, all-steel, all-riveted chair that folds so the upholstered back and seat are protected between two metal parts during storage. Available in several beautiful color combinations with metal parts in harmonizing metallic colors. All chairs have moulded rubber foot pads. Hostess trucks, either vertical (19¾″ wide x 42″ long x 42½″ high) or horizontal (39″ wide x 62″ long x 24″ high), provide compact transportation and storage. Architects specify Hostess chairs and trucks for maximum utilization of auditorium-gyms.

THE VERTICAL TRUCK. Allows one man to move twenty-four chairs with ease. Obtainable in colors to match chairs.

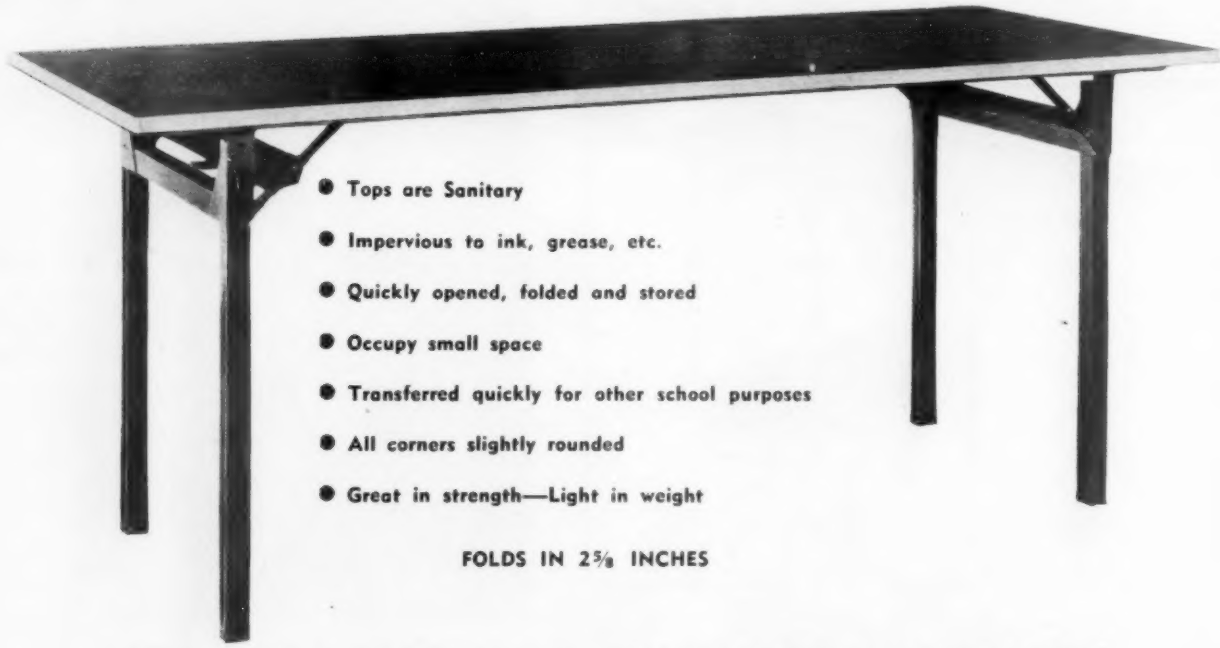
THE HORIZONTAL TRUCK. For under stage auditorium use. Carries 36 chairs. Special trucks built to specification.

HOWE FOLDING FURNITURE INC.

1 Park Avenue, New York 16, N. Y.
Telephone: Murray Hill 5-5925

HOWE ALL STEEL CHASSIS FOLDING TABLES

for Cafeteria & Classroom



- **Tops are Sanitary**
- **Impervious to ink, grease, etc.**
- **Quickly opened, folded and stored**
- **Occupy small space**
- **Transferred quickly for other school purposes**
- **All corners slightly rounded**
- **Great in strength—Light in weight**

FOLDS IN 2⅝ INCHES

WITH MASONITE TEMPERED PRESDWOOD, LINOLEUM, PLASTIC-FACED PLYWOOD and FIR PLYWOOD TOPS.

Construction Facts

- A wonderfully strong foolproof lock, with a brace to every leg, and yet one release point for each pair of legs.
- An aluminum edge around entire top. Aluminum edge is securely fastened to the top and can never come loose. All corners are slightly rounded.
- Not one screw or bolt to come loose. Riveted and welded throughout.
- Chassis is manufactured of high grade carbon steel and is riveted to the top thus insuring a strong, sturdy, rigid, and durable unit. Tables are self adjusting on uneven floor.
- Heavy steel supporting side rails with 1½" square tube steel. Legs with lapped seams, give great strength. Light weight, no breakage, round glider leg caps, absolutely smooth, protect carpets and floors.
- Standard height 30 inches. Lower heights available at slight advance in price.

SIZES: 24 x 36, 30 x 48, 24 x 72, 30 x 72, 36 x 72, 24 x 96, 30 x 96, 36 x 96

Benches and Rounds Are Also Available

IF IT FOLDS ASK **HOWE**

FOR SPECIAL TYPEWRITER USE
26" x 14¾", 26½" high
Folds to 3½"

MITCHELL MANUFACTURING CO.

Milwaukee, Wisconsin

Fold-O-Leg Tables Folding Choral Elevations
Folding Band Elevations

FOLD-O-LEG TABLES

For cafeterias, banquet halls, recreation and social rooms, class rooms, recreation centers and trade schools, wherever and whenever strong tables are needed . . . Provide greater seating capacity without knee interference . . . stored in 300% less space . . . Rigid when set up.

Fold-O-Leg Tables are good looking with a satin finish top of brown Tempered Masonite Presdwood . . . with sturdy tubular steel folding legs . . . folded thickness only 2¾". Made in convenient sizes in 22, 24, 27 and 29" heights. Write today for Booklet No. 3.

LEGS FOLD UNDER

Easy Storage—Less Space

25% Greater Seating Capacity

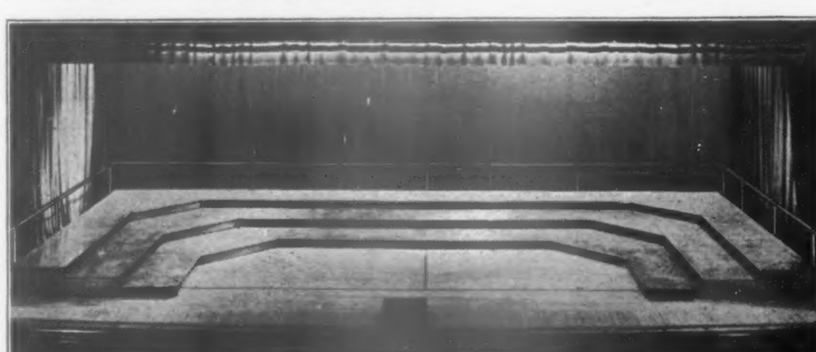
BOOKLETS (Illustrated)

3. FOLD-O-LEG TABLES 4. FOLDING CHORAL ELEVATIONS 5. FOLDING BAND ELEVATIONS

STEEL-LEG PORTABLE FOLDING STANDS

FOR BAND, ORCHESTRA AND CHORAL GROUP ELEVATION, ALSO PLATFORMS FOR PLAYS, ETC.

Mitchell Portable Stands can be adapted to any need. Constructed in rigid units easy to handle. Rapidly moved from music room to auditorium stage or even to other places for concert work. Minimum storage space required for folded units and demountable safety steel rail. Available in any size. Thoroughly tested by many outstanding educational institutions. Write today for Booklets No. 4 and No. 5.



PARTIAL LIST NOW USING MITCHELL PORTABLE FOLDING STANDS

Upland Schools
Upland, California

Colorado State College
Greeley, Colorado

Yale University
New Haven, Connecticut

Sterling Morton High School
Cicero, Illinois

Elkhart High School
Elkhart, Indiana

West Senior High School
South Bend, Indiana

Michigan State College
East Lansing, Michigan

Board of Education
Ferndale, Michigan

Sarah Lawrence College
Bronxville, New York

St. Joseph's Academy
Mc Sherrystown, Pennsylvania

John Adams High School
South Bend, Indiana

U. S. Military Academy
West Point, New York

Orange High School
Orange, Texas

Washington High School
Milwaukee, Wisconsin

Watsonville Union High School
Watsonville, California

Morgan Township School
Valparaiso, Indiana

LaSalle-Peru Twp. High School
LaSalle, Illinois

Vaughan General Hospital
Hines, Illinois

Board of Education
Robbinsdale, Minnesota

Villanova College
Villanova, Pennsylvania

Bratenahl School
Brighton, Ohio

North Division High School
Milwaukee, Wisconsin

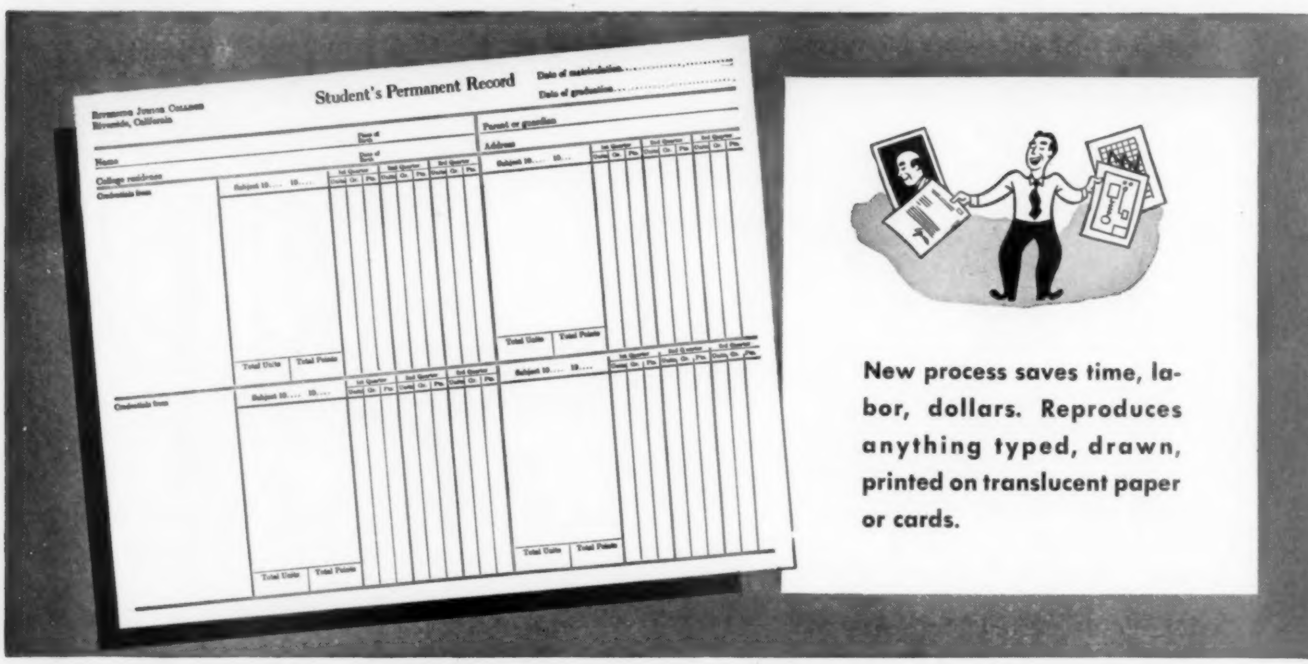
Wheaton College
Wheaton, Illinois

University of Illinois
Urbana, Illinois

O Z A L I D

DIVISION OF GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, NEW YORK
Ozalid in Canada—Hughes-Owens Co., Ltd., Montreal

REPRODUCE YOUR STUDENT RECORDS IN 25 SECONDS!



New process saves time, labor, dollars. Reproduces anything typed, drawn, printed on translucent paper or cards.

This student record form was printed on ordinary translucent paper, which you can order from any printer.

You can type on it . . . or make additions with pencil or pen.

Whenever you want an up-to-minute copy you remove the record from the file . . . place it on a sheet of Ozalid paper and feed both into the new Ozalid Streamliner.

25 seconds later you have an exact-size reproduction – completely dry, ready for distribution.

What's more, it's a positive (not negative) copy, much easier to read and check. And unbelievably economical! An 8½ x 11-inch copy costs less than a cent and a half to make!

Any student or teacher can operate the Streamliner with maximum efficiency in any classroom or office. No darkroom is required.

Hundreds of Uses in Every School and College

*Engineering and art drawings up to 42 inches wide, any length, are reproduced in blue, black, red, or sepia colors . . . on white or tinted paper, cloth, foil or plastic.

All Ozalid prints are made in same manner.

*Ozalid prints serve as exam sheets. Are prepared by the teacher—without "leaks." Can be graded quickly by making composite prints with a marked master.

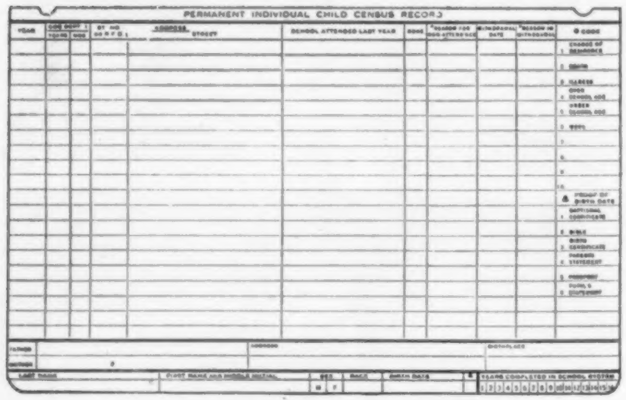
*Transparent overlays—in different Ozalid colors—are made for visual aid instruction . . . and projection in stereopticon machines.

*Beautiful Ozalid Dryphotos are produced from transparent film positives which can be made from any negative.

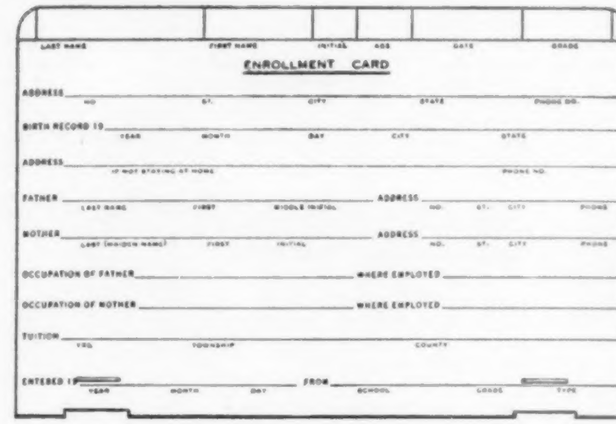
*Music sheets, instruction pamphlets, even school newspapers are prepared.

Write today for free illustrated Booklet No. 74.

Typical School Records from the POSTINDEX Library of Forms


PERMANENT INDIVIDUAL CHILD CENSUS RECORD

Postindex form 81-C-6385-8. This shows one side of a two-page card which incorporates complete census information and attendance information. The back of this card shows history of employment


ENROLLMENT CARD

LAST NAME FIRST NAME INITIAL AGE DATE GRADE

ADDRESS

BIRTH RECORD 19

FATHER ADDRESS

MOTHER ADDRESS

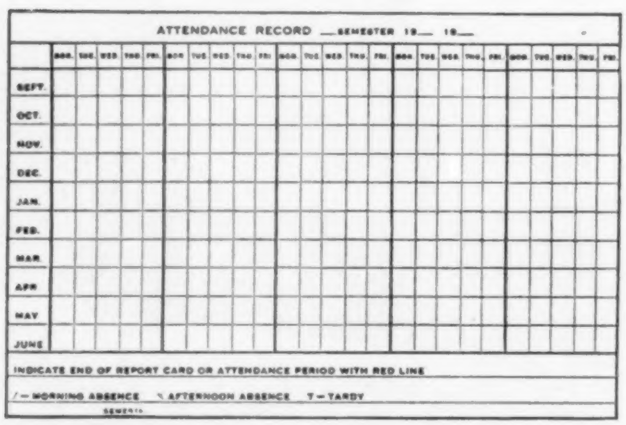
OCCUPATION OF FATHER WHERE EMPLOYED

OCCUPATION OF MOTHER WHERE EMPLOYED

TUITION

ENTERED 19 FROM

Postindex form 81-B-2916-8P. This is a two-page form with illustration showing the enrollment record. The back of this same card covers daily program record

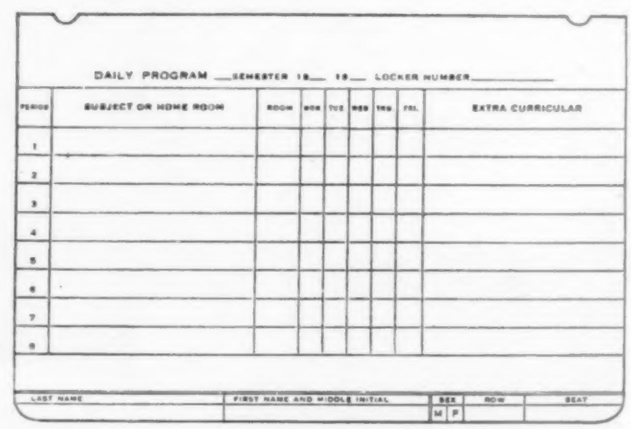

ATTENDANCE RECORD — SEMESTER 19— 19—

SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE

INDICATE END OF REPORT CARD OR ATTENDANCE PERIOD WITH RED LINE

/ — MORNING ABSENCE \ AFTERNOON ABSENCE T — TARDY

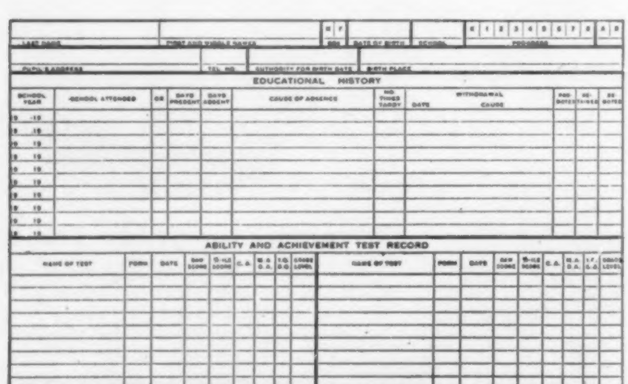
Postindex form 81-B-2922-8. This is an insert form which may be filed with the individual pupil cumulative record. The side illustrated shows attendance record for a year. The back of this particular form has a daily program record


DAILY PROGRAM — SEMESTER 19— 19— LOCKER NUMBER

PERIOD SUBJECT OR HOME ROOM ROOM MON TUE WED THU FRI EXTRA CURRICULAR

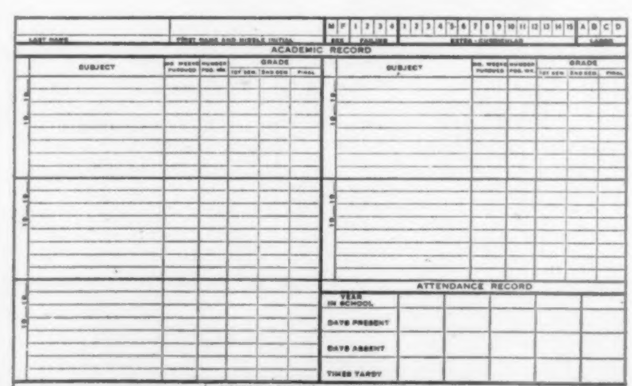
LAST NAME FIRST NAME AND MIDDLE INITIAL SEX ROW SEAT

Postindex form 81-B-2913-8. This is a four-page form giving the daily program for a student. The other pages are devoted to registration information and attendance


EDUCATIONAL HISTORY

ABILITY AND ACHIEVEMENT TEST RECORD

Postindex form 81-C-06072-8CT. This illustration shows one page of a four-page form covering educational history, ability and achievement test record. The other three pages provide for scholarship record and health information

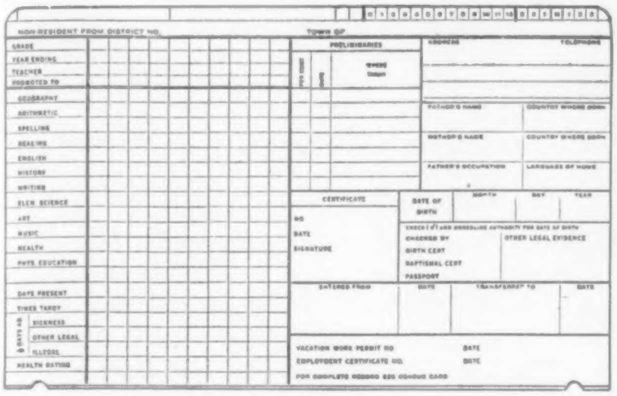

ACADEMIC RECORD

ATTENDANCE RECORD

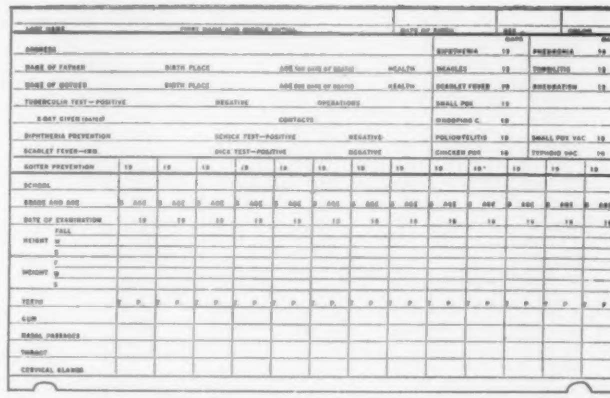
Postindex form 81-C-05971-8CT. This illustration shows one page of a four-page form with academic record and attendance information. The other three pages provide for general information, extra-curricular activities, achievements, with space for intelligence and achievement tests

For additional information, write POSTINDEX DIVISION, ART METAL CONSTRUCTION CO., Jamestown, N. Y.

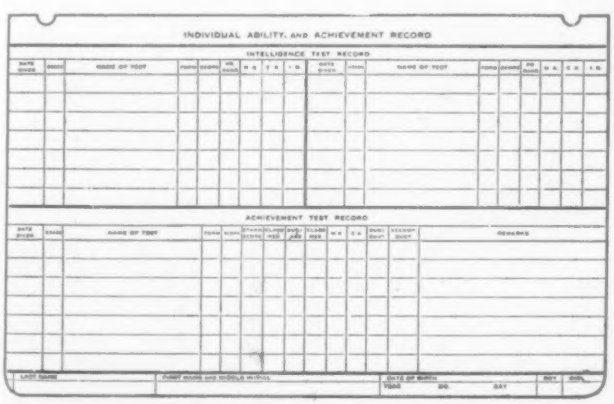
Typical School Records (Cont'd)



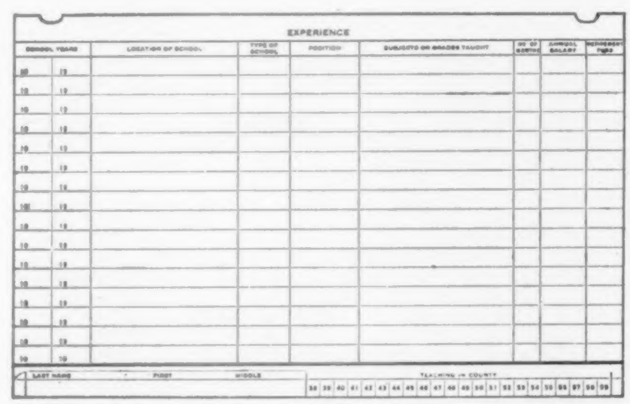
Postindex form C-4077-P. This is a four-page form showing the Elementary scholastic record. One of the other pages covers scholastic record for Junior and Senior High School while the other two pages provide space for recording pupil activities, guidance facts, intelligence and achievement tests



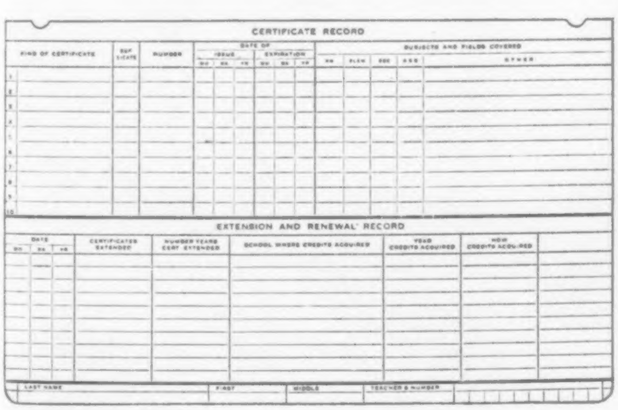
Postindex form 81-C-06121-8CT. This is a four-page record showing a portion of health history. The other three pages are devoted to a continuation of the same record



Postindex form 81-C-6387-8. The illustration shows front covering intelligence tests and achievement tests. The back is a continuation of achievement tests



Postindex form 81-C-06112-8CT. This is a four-page record showing data on teacher's experience. The other three pages are devoted to personal information, educational background, special training and certification, health and general remarks



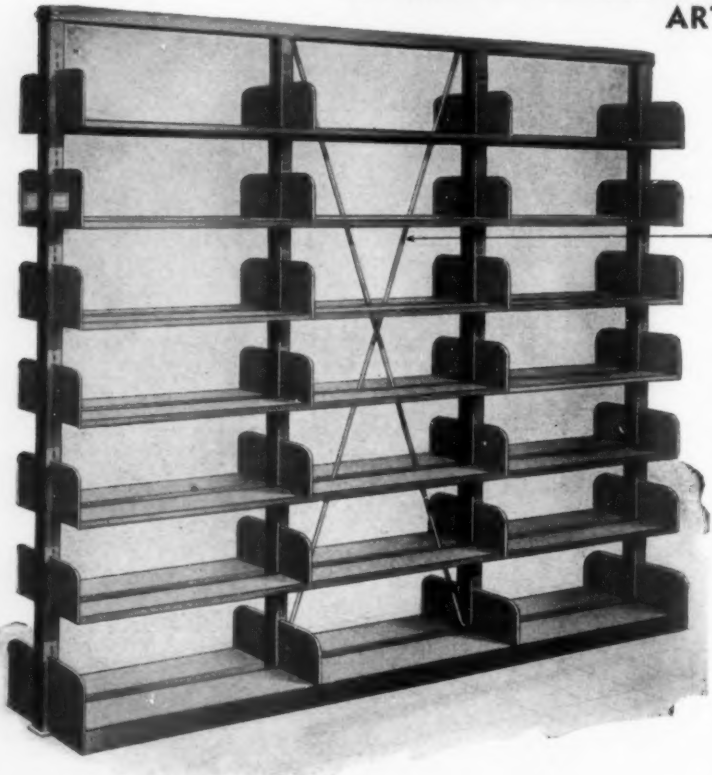
Postindex form 81-C-6370-8. This is a four-page record of teacher's certification, extension and renewal record. The other three pages are devoted to experience, training and general information

Postindex form 96-C-5740-14. This is a four-page form for recording State Aid data. The other three pages provide record in regard to statistical information, census, enrollment and teachers

For additional information, write POSTINDEX DIVISION, ART METAL CONSTRUCTION CO., Jamestown, N. Y.

Art Metal for the School Library

ART METAL "UNITYPE" BOOKSTACKS



UNITYPE Bookstacks are available in two styles: Free-Standing Stacks and Top-Braced Units. Both models may be had single or double-faced. Write for booklet.

The TOP-BRACED bookstack is recommended for locations where it is undesirable to use floor fastenings. Top bracing makes floor fastening unnecessary.

ART METAL EQUIPMENT for LIBRARIES includes

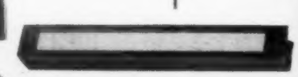
Standard Type Book Stacks	Vertical Files
Bracket Type Book Stacks	Stairs and Railings
Bracket Type Rolling Book Stacks	Booklifts
Charging Desks	Card Catalog Files
Magazine Racks	Reading Tables
	Book Trucks

FREE-STANDING UNIT—DOUBLE-FACED

Each double-faced section contains 2 closed base shelves 10" deep, center dimensions; 12 shelves, adjustable 1" on centers, 8" deep, center dimensions; stack 90" high overall. Each unit must be securely fastened to floor.

FREE-STANDING UNIT—SINGLE-FACED

Each single-faced section contains 7 shelves adjustable 1" on centers, stack 90" high overall, 8" deep, center dimension. Must be fastened securely to floor.



Detachable shelf label holders are available for the square front shelves.

BOOK SHELF UNITS

This is the famous Space-A Shelf unit using the Art Metal library shelf adjustment principle. Detachable end panels are used to save space in batteries of units — especially suitable for schools.

For additional information, write ART METAL CONSTRUCTION CO., Jamestown, N. Y.

Remington Rand

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SALES AND SERVICE OFFICES IN
PRINCIPAL CITIES OF THE WORLD

Administrative Aids for Schools and Colleges

Remington Rand's modern record equipment and time-saving devices are, today, helping schools and universities cope with the heaviest administrative duties and record keeping problems in the history of education.

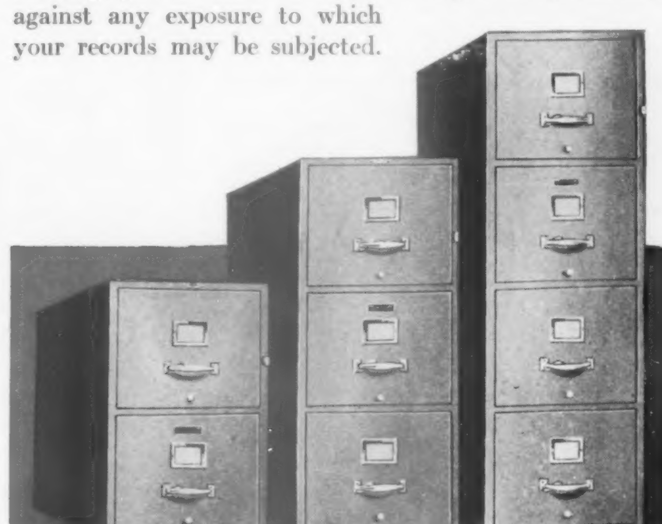
School officials have learned to rely on our systems and equipment to successfully administer their purchasing and stock, enrollment, budget and financial accounting, employment, operation and maintenance activities.

Since only a few of Remington Rand's many products specifically adapted to administrative needs in schools and libraries can be shown on these pages, school officials are invited to write us direct with reference to any of our distinctive systems, equipment and services to suit their particular requirements.

Insulated Equipment for Record Protection

School records are *public records*, and it is the duty of the school officials who are trusted with their care and preservation to see that they receive ample protection from fire and other hazards. This obligation should be realized because school records, in addition to their historical significance, are of great value to each student throughout his lifetime. Don't rely on old-style files and safes. Depend, rather, on our Safe-Cabinets and Files which have been thoroughly tested and are certified to provide protection against any exposure to which your records may be subjected.

Safe-Cabinet—*Safe-Cabinets are used for protecting general school records. Available in a variety of sizes; certified for one, two or four hours' protection against fire hazards. Adjustable interior equipment, such as card index drawers, file drawers, document files and shelves are available to tailor each unit to specific housing needs.*



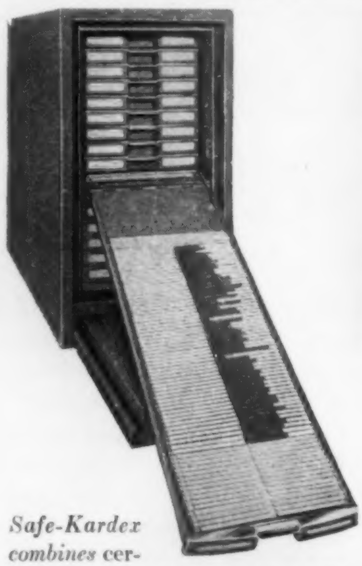
Safe-Files—*Heavily insulated Safe-Files possess all the operating convenience of modern files* plus *the ability to protect records for one hour's exposure to fire. Available in many sizes for housing cards as well as letter or legal size paper records. The Safe-Ledger Tray, another insulated unit, not illustrated, is designed for schools using machine-posted records.*

Kardex Simplifies Records for School Administration

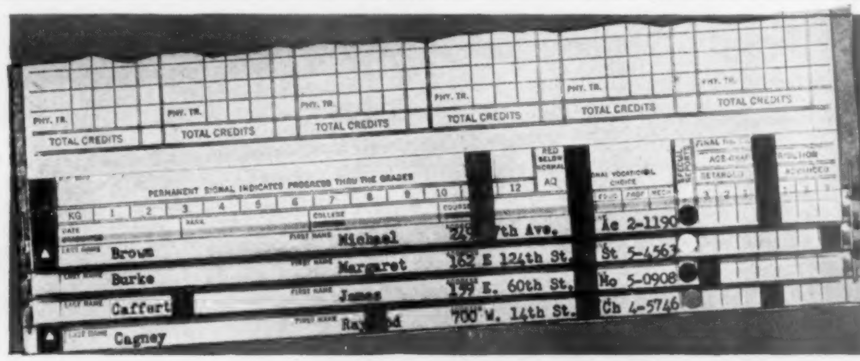
School records in Kardex Visible Systems give school officials instantaneous reference to all pupil, teacher and staff activities—providing an efficient, centralized record control.

Kardex brings facts into view with no loss of time or motion. Colored signals on visible margins reveal vital information at a glance. When entries are to be made or reference to complete data is required, a flip of the finger brings the entire record in view with no need of removing the card. It lends itself readily to easy, rapid posting, cutting your need for clerical help to a minimum.

The flexibility and simplicity of Kardex are such that individual record requirements are easily met.



Safe-Kardex combines certified fire protection with visible control for important school records.



A glance at this visible school record will illustrate how planning can be simplified with Kardex charted facts. Notice the various signals on each card which tell the reader, at a glance, specific facts about the pupil. Kardex is being widely used for many administrative school records, including Pupil History, Pupil Guidance, Pupil Health, Pupil Attendance, Pupil Program, Purchase and Stock, Teacher Placement, Teacher Substitute, Budget, Financial and Textbook Records.

"School Administration—Records and Equipment"

Send today for our free 76-page book, "School Administration—Records and Equipment", *illustrating forty standard records used by thousands of schools and universities. Equipment and forms are illustrated which apply directly to specific administrative problems. Remington Rand's ability to develop special systems to meet individual situations is fully explained. You will find this book helpful and well worth preserving for reference whenever changes are required in your record keeping procedures.*

Remington Rand Inc.

SCHOOL DEPARTMENT Remington

315 FOURTH AVENUE

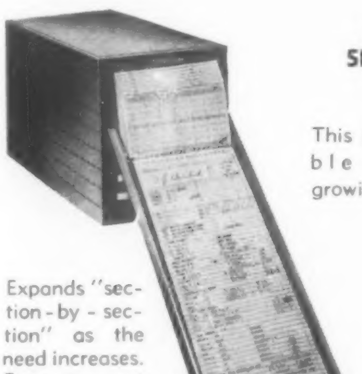
THE VICTOR SAFE & EQUIPMENT CO., INC.

North Tonawanda — New York

VICTOR CABINET VISIBLE

For speedy and efficient record keeping. Actually saves up to more than 50% posting and reference time.

With Victor Visible, pertinent information can be referred to at a glance on ¼" protected visible margins. --Pockets are easily shifted singly or in groups.



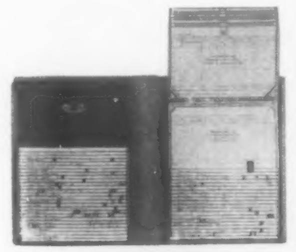
VICTOR SECTIONAL VISIBLE

This is the ideal visible equipment for growing card records.

EXPANDS - SECTION BY SECTION!

Expands "section-by-section" as the need increases. Easy to post and signal quickly and accurately—instantly referred to. An entire drawer of information available at a glance. Sections stack as rigidly as a cabinet to any height you wish and can be added to as needed.

Also available in wood, 3 slide units.

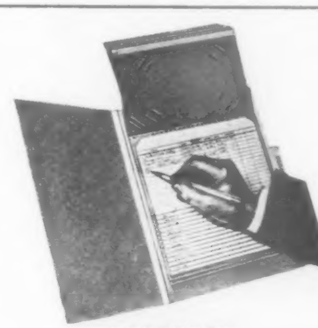


VICTOR BOOK VISIBLE

All features of cabinet visible in handy book form, bound in either pyroxylin coated luggage cloth or metal, sizes for 8 x 5, 6 x 4, or 5 x 3 cards. The same Victor "easy-shift" pockets—the same handy visible reference. Ideal for individual student or registration records. Economical, lightweight and convenient.

VICTOR VISIBLE REFERENCE EQUIPMENT

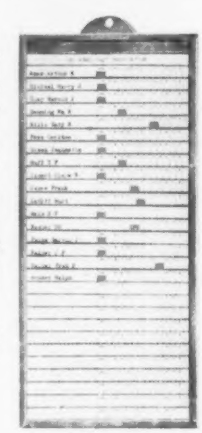
Desk stands, switchboard brackets, wall brackets and rotaries (illustrated) for listing index or tube reference or card lists. Frames can be easily swung back and forth and referred to from either side. Panels can be hung on the wall. All references easily and quickly changed or removed.



RECORDEX
The Handy Visible Record Folder

20 pockets with ¼" transoloid protected margins in a heavy pressboard folder made to fit desk or brief case. Ideal for individual class on subject records. 2 different styles.

The Victor IN and OUT INDICATOR



A directory to show what individuals are absent and when they will return. A green signal moves on a time scale printed in quarter hour periods. Available in 3 sizes.

"MAK-UR-OWN"

Trade Mark-Reg. U.S.A.

THE ORIGINAL—GENUINE

SNIP THE STRIP TO ANY LENGTH YOU WISH

CELLULOID

INDEX TABS

Write, type or print any index you wish. Attaches instantly and permanently to any page or card. 3 widths for 1, 2 or 3 lines of indexing. Beaded edge speeds "pick-up" and reinforces tab.

7 COLORS—printed sets A to Z, days, months, etc., in 6" strips fill every indexing need.

MAK-UR-OWN HINGES—for fastening sheets, looseleaf pages, drawings, etc., in ring books and the like.

MAK-UR-OWN DIE-CUT SHIELD TABS—for uniformity and permanence. Saves the time and trouble of cutting 6" strips. 4 sizes (lengths) ⅜" extension only.

ORDER FROM YOUR STATIONER OR OFFICE EQUIPMENT DEALER

DIEBOLD, INC.

1533 Fifth St., S. W., Canton 2, Ohio

Diebold serves schools in many ways

Here are a few of the models of equipment that make up the Diebold Systems and Protection lines that are widely used by progressive schools.

To best apply the individual advantages on each of these work savers, ask for your Diebold Man's recommendation. He is trained to analyze equipment conditions and submit helpful suggestions. He's unbiased, too, because Diebold offers all four types of record handling equipment: Rotary files, Vertical files, Visible files, Microfilm —as well as record and money protection equipment. For complete data, call the Diebold Man, or write Diebold, Inc., Canton 2, Ohio.

Diebold

RECORD-HANDLING *Systems*

ROTARY VERTICAL VISIBLE MICROFILM

MICROFILM • ROTARY, VERTICAL AND VISIBLE FILING EQUIPMENT • SAFES, CHESTS AND VAULT DOORS • BANK VAULT EQUIPMENT BURGLAR ALARMS

Flex-Site Loose-Leaf Visible Binders

Flex-Site is the original loose-leaf visible binder with innumerable installations in the nation's schools. Made in a variety of models and sizes taking up to a thousand or more records per unit. Form sizes from 2⅜" x 7½" to 15½" x 18" or larger. The easily read visible margins of Flex-Site records speed finding. Especially applicable when flexibility, portability, compactness, low cost and easy fire protection are important factors.

Multi-Flex

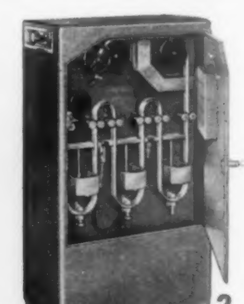
A system of extending the advantages of individual Flex-Site units (described above) to larger installations. All necessary operations such as posting, reference, record changes, and shifting are performed without removing the individual Flex-Site units. 10,000 records easily housed in this manner.

Flofilm—*The complete microfilming process*

Diebold Flofilm is a self-contained microfilm process consisting of three coordinated units (1) Camera (2) Automatic film processor (3) Reader—for projecting images in original sizes for reference or copying. Your original records never leave the premises; film is automatically processed in the confidence of your own office within one hour after exposure.

The bulk of stored records—historical, irreplaceable, invaluable — can be reduced 99% when reproduced the Flofilm way. Store extra copies of the film off the premises for extra protection against fire loss. Back reference to filmed media can be faster than with the original through properly applied indexing methods.

1



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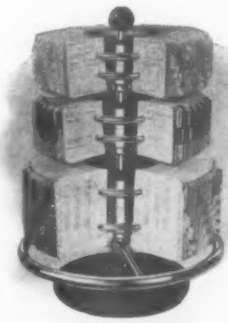


Reveldex

For rapid reference jobs. Rotors revolve together or independently as desired. One base will hold a number of rotors, each with a capacity of 1,600 records; card sizes from 2½" x 3" to 6" x 6".

Tra-Dex Vertical Visible Files

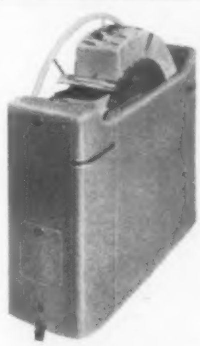
Adds visibility to vertically filed records for speedy glance finding and faster processing. Makes visual checking and control possible by exposing columns of entries. Visible margins can be ½" to 3" wide. Available in portable sections and large capacity manifold styles for cards up to 12" high in any width.

V-Line Posting Trays

Automatic "V" throughout the trays and other exclusive features help to eliminate "getting ready to post" operations . . . reduce "machine waiting time" between postings . . . increase overall record production. Adaptable to any form up to 17" x 14" on bond, ledger or index bristol.

Fire Resistive Safes

Diebold's reputation has been built on record protection equipment. Tested by Underwriters' Laboratories for endurance in 1, 2 and 4 hour fires, plus drop and explosion tests. Any arrangement of safe interiors can be provided.

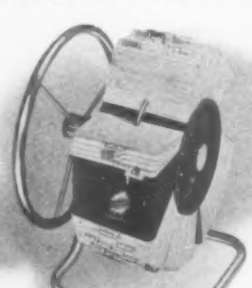


Cardineer Rotary Card Files

Master Cardineer

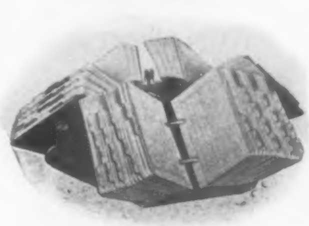
Only Diebold can give you Cardineer! This model available in both hand and motor operated types. Accommodates cards 8" x 5". A turn of the rotor brings 5,500 records per unit to the operator for convenient desk high posting and reference.

The Master Cardineer is the only rotary file offering these facilities . . . (1) removable segments to divide work . . . (2) three edges of cards exposed for guiding and flashing . . . (3) open rotor sides for offsetting . . . (4) desk top or direct rotor posting optional . . . (5) segments for holding double rows of cards . . . (6) 30" of cards visible at all times.



Desk Model Cardineer

Choice of two models. Single rotor capacity 1,500 records. Double rotor capacity 3,000 records — both for any size card up to 6" x 4".

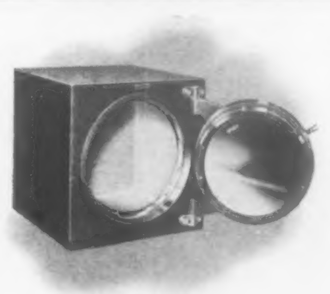


Desk Model Cardineer
{Large}

This model revolves in a horizontal plane. The three card holding sections are removable for division of work. Capacity: 2,500 cards. Accommodates sizes 6" x 3½" to 8" x 8" or 9" x 5½".

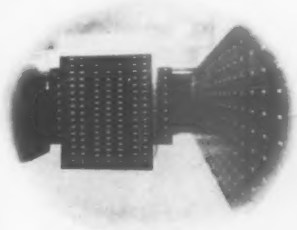
File Storage Room and Book Vault Doors

File Storage Room doors carry fire ratings of ½ hour and 1 hour. Book Vault doors are rated at 2, 4 and 6 hour fire endurance. All doors bear Underwriters' Laboratories labels and are equipped with relocking and unlocking safety features.



Cashgard Chests

Cash kept on premises or accumulated pending deposit present burglary and holdup hazards. Protect your funds in a Diebold Cashgard Chest. Reduced burglary insurance premiums will repay the full cost in a surprisingly short-time.



Safe-T-Stak Storage Files

For semi-active and inactive records. Reduce storage space requirements up to 40%. All steel, in every wanted size. Can be interlocked vertically, side-by-side, and back-to-back for maximum safety. Fully loaded drawers open easily, even when stacked ceiling high.

THE GLOBE-WERNICKE CO.

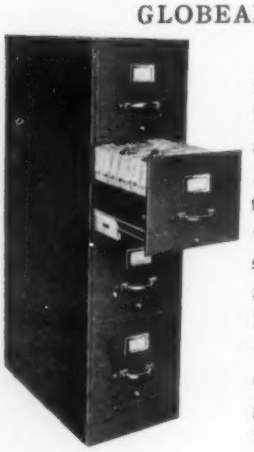
Norwood, Cincinnati 12, Ohio

Makers of Outstanding Steel Equipment, Quality Filing Supplies and Systems, Useful Office Aids

TODAY, schools and universities are carrying the heaviest administrative load in the history of education. It is therefore more important than ever to equip the office with business tools that will speed up and simplify procedure. Such tools are the business of The Globe-Wernicke Co. which has had more than 60 years' experience in this highly specialized field. Only a few of this company's many famous products can be shown here, but your Globe-Wernicke dealer will be glad to give you every assistance in selecting attractive, sturdy, dependable equipment to fill your needs. If you prefer, you may write to the company.

★ ★ ★

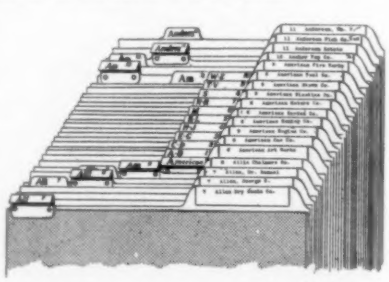
GLOBEART STEEL FILES



Smartly modern in design, these famous cabinets are engineered for lasting service and quiet, easy operation even when filled to capacity. High grade materials are used throughout. Each drawer is equipped with ball-bearing progressive extension slide and automatic catch. Available in 2-, 3-, 4-, and 5-drawer styles, letter and legal sizes. Can be fitted with inserts for cards, checks, or documents. Finished in green, seal gray, or walnut or mahogany grain. Send for FREE circular.

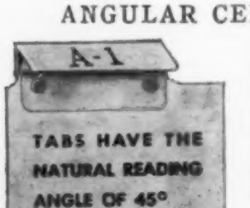
SAFEGUARD FILING SYSTEM

So completely simple and practical that the newest clerk can file papers accurately, find them quickly; so adaptable that it can be expanded from a single drawer to a hundred cabinets without major change.



FREE! "Find-i-tis", the popular and authoritative booklet on correct filing procedure. Write for your copy now.

ANGULAR CELLULOID TAB GUIDES



They look you in the eye—make filing and finding quicker and easier. No metal to obstruct view of the tab. Long-lasting because tab *gives with the guide.* Exclusive construction carries pressboard shoulder to top of tab for extra strength. Rounded corners on guides prevent dog's-ears.

GLOBEART STEEL DESKS

Companions in styling, materials, and workmanship to the GlobeArt Files, these desks offer many advantages such as roomy, smooth-operating drawers, interchangeable box drawers, extra foot room. Available in various models; finished in same colors as files. Free circular on request.

STEEL VISIBLE RECORD EQUIPMENT

Send for FREE information-packed circular

Actual time studies show that Globe-Wernicke Visible Record Equipment can save up to 33¾ minutes out of every hour spent in finding and refiling card records. You pull out a tray and the cards are visible for swift identification; flip up the one you want—it stays put so you have both hands free to jot down notes or make entries. Cards are easily removed and replaced, yet can't come loose till you release them.

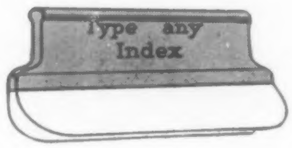
ALL TYPES OF STOCK AND SPECIAL FORMS AVAILABLE

Wide application of Globe-Wernicke Visible Records has enabled us to collect a tremendous variety of stock forms. To meet special needs, our Records Engineers will be glad to design and supply you with special forms.

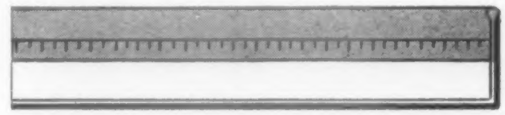
"U-MAK-A" INDEX TABS . . . Put Facts at Your Finger Tips!

Made of heavy celluloid with cloth skirt. The beaded edges give an easier grip, and greater strength.

Key your catalogs, directories, text books . . . quickly, easily, inexpensively. Attractive selection of bright colors.



Shield Type is ready-made in four handy sizes—⅝", 1", 1½", and 2"—all with ⅜" tab projection.



Strip Type has built-in measuring scale for quick accurate cutting.

Indexed Type has letters printed directly on the celluloid; two sizes: ¼" x ¼" and ⅜" x ½"; green only.

AGATE CARD INDEX TRAYS

Thrifty and practical, stout construction for long service. Removable lid is dust-proof. Follower block on counter-sunk rod keeps cards upright. All standard card sizes and check size.

BOX FILES

Popular for current letters, bills, and invoices. Students and writers like them for lecture notes, reports, and manuscripts. Indexed A to Z or 1 to 31. Choice of snap or suitcase lock.

EVERY DAY FILES

For sorting papers and organizing work, this patented office aid is now handsomely restyled in rich blue linen-weave fabric printed in silver and black, with high-visibility gray tabs. Wide selection of indexing.

FANFOLD LABELS

Essential for labeling file folders, and a "best buy" for every labeling need. New, easy-to-use window tray package contains continuous strip of 500 labels which are guaranteed not to curl or stick together. Choice of nine colors. Free folder sent on request.

GLOBE-WERNICKE'S WORLD-FAMOUS SECTIONAL BOOKCASES

Superb wood, skillfully worked by master craftsmen in designs of classic simplicity has made the Globe-Wernicke Sectional Bookcase an attractive furnishing for home, school, studio, or library. Its functional utility has won world-wide fame. Timeless in pattern and enduring in construction, many have passed the half-century mark in active use. Never too large or too small for your needs. You buy only the sections you require, add more as your library grows. Dustproof glass doors glide silently over the tops of the books. Available in fine natural woods and in imitation walnut or mahogany.

Send for FREE Literature

* * *

UNDERWOOD CORPORATION

Manufacturers of Underwood Typewriters, Adding-Figuring Machines
Accounting Machines and Office Supplies

One Park Avenue, New York 16, N. Y.

Train Them TODAY on the Typewriter They'll Use TOMORROW!

The New UNDERWOOD RHYTHM TOUCH STANDARD TYPEWRITER

Get your students off to a good start. Right from the beginning . . . *Rhythm Touch* helps them develop professional technique and speed.

Rhythm Touch is a new typing concept . . . the latest exclusive Underwood feature. It's a smooth, rhythmic key action . . . made possible by an accurate, perfectly balanced keyboard.

Give student fingers *Rhythm Touch* with this keyboard. You'll soon agree that *Rhythm Touch* is a wonderful asset in teaching your students to type. Likewise it helps to step up typing speed . . . do more work . . . better work . . . with less fatigue.

You can expect better results from your students when you give them the added advantage of *Rhythm Touch*. Key your student's typing to *Rhythm Touch*—an exclusive Underwood feature.

UNDERWOOD STANDARD NOISELESS TYPEWRITER. Quiet is essential in school administration work. An Underwood Noiseless Typewriter promotes efficiency by *insuring* quiet in your office. Quiet is an invaluable aid to better work because it reduces fatigue and conserves productive energy. The "pressure printing" principle of typing results in the elimination of distracting noise.

UNDERWOOD ALL ELECTRIC TYPEWRITER. When your secretary lightly touches the keys, electricity does the work. Some of the thrilling features: electric keyboard, electric shifting, electric tabulating and electric back-spacing. Even the carriage returns electrically and sets itself for the next line. Easiest operating typewriter.

UNDERWOOD PORTABLE—An Underwood Portable provides the answer to "How can I do that *extra* work?" You will discover that this compact, light-weight Underwood Portable is tops in personal writing equipment. Besides, you'll get dividends in time saved and work accomplished.

• *SALES AND SERVICE EVERYWHERE* •

UNDERWOOD CORPORATION

Manufacturers of Underwood Typewriters, Adding-Figuring Machines
Accounting Machines and Office Supplies
One Park Avenue, New York 16, N. Y.

Accounting Machines for Students' Accounts

UNDERWOOD SUNDSTRAND MODEL A ACCOUNTING MACHINE

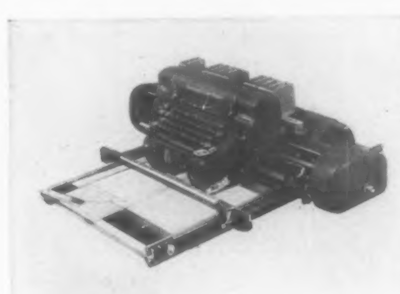
Greatly increased student enrollments offer a challenge to today's school administrators. Students' accounts must be handled quickly and accurately . . . and with a minimum of time and effort.

You can meet this challenge effectively with the Underwood Sundstrand Model A Accounting Machine. Here's how:

1. Posts the student's statement, student's ledger account, makes the entry to the Daily Journal—*all in a single operation.*
2. *Automatically* computes and prints each student's account balance.
3. *Automatically* prints the day's Charges and Credits.

The budget-minded school administrator will recognize the extraordinary degree of application versatility of the Model A. This remarkable low-cost machine is easily within the purse limitations of the average school. Your Underwood Branch Office representative will gladly demonstrate the Sundstrand Model A Accounting Machine.

UNDERWOOD SUPPLIES—"There's a picture of you—in every letter you write." For a good, clear, clean *impression* . . . use Underwood Corporation carbon papers, ribbons and other supplies. The alert secretary knows that superior typewriting accessories result in superlative work. Be proud of ***your*** correspondence, notes and reports . . . specify Underwood Corporation Supplies.



ELLIOTT FISHER ELECTRIC KEYBOARD ACCOUNTING MACHINE—Ideal machine for posting institutional accounting records that require regular use of an alphabetic keyboard machine.

Its *flat writing surface* is an exclusive feature unavailable in any other accounting writing machine. This makes possible Elliott Fisher's renowned application, flexibility and speed.

UNDERWOOD SUNDSTRAND ADDING-FIGURING MACHINE—This simple, easy-to-learn 10-key keyboard adding-figuring machine will repay its original cost . . . many times over . . . with many precious hours saved. Speeds the figure-work in every school office, whether large or small. Write for free Adding Machine Line Folder.

• UNDERWOOD PRODUCTS SPEED SCHOOL BUSINESS •

Color

Recognizing that office efficiency bears a definite relationship to the worker's surroundings—whether top executive or junior clerk—"Y and E" engineers several years ago began a series of tests that have revolutionized office planning and layout.

The chief factor in any office is the equipment. The greater part of every worker's time is spent at his desk, hence "Y and E" engineers selected the desk as the keynote of the whole plan of stepped up work efficiency.

In so doing they took recognition of a long neglected factor of the utmost importance to the user of that desk, namely, eye fatigue. Too great contrast . . . too little contrast require extra muscular adjustment by the worker's eyes—cause headaches, tiredness and all the many familiar symptoms of eye fatigue.

To correct this condition "Y and E" engineers, after three years of research, developed Neutra-Tone Gray, an entirely new finish for office equipment. It is a special and exclusive blend of various pigments that reduces light absorption 30%. One of the nation's leading illumination experts has pronounced Neutra-Tone Gray to be a *warm gray* and a scientifically correct finish having a minimum of glare and light absorption.

It was soon recognized that the color harmony of the offices was an important factor in still further increasing working efficiency. The blending qualities of the Neutra-Tone Gray finish immediately made possible a much larger number of decorating combinations than had ever been available with a single color.

By so greatly expanding the possible combinations, you may now plan the exact color scheme that best suits your requirements . . . without the expense of special furniture finishes.

Color Combinations

To help you visualize to the fullest the possibilities of this important new color development, our engineers have prepared an ingenious four-way *color visualizer* that enables you to study a large number of possible color combinations. Colors have been selected for:

1. Standard colors for wall paints.
2. True lithographed reproductions of rugs and carpets.
3. Window drape reproduction in color.

All these color units are so fastened in a ring binder that any combination can be brought together conveniently. To this is added a transparent sheet on which is printed office furniture in Neutra-Tone Gray finish. Thus, you can study all the important factors that enter into selection of an office color scheme, and prove that the new "Y and E" Neutra-Tone Gray will harmonize with all decorative elements. You may obtain the use of this color visualizer merely by calling or visiting the "Y and E" Branch or representative in your city.

Designed for Comfort and Harmony

The complete family of "Y and E" "Style Master" steel desks and tables covers every type of office work space requirement. The "Executive," the "Associate," and the "General Office" lines are designed to function in a modern efficient manner.

The comfort and harmony factors stressed in the design of the "Style Master" (4900 line) steel executive desk are:

Streamlined for appearance and architectural conformity.

Molded non-glare linoleum top to ease eye strain and do away with uncomfortable edges.

All outside corners and edges molded (no sharp corners).

Trim (drawer pulls, etc.)—especially designed to conform with contour of desk.

Wide pedestals (cap size)—to balance proportions.

Base—recessed box type, black enameled.

The "Styled Executive" (4900 line) is the result of much study and consultation with many of the top ranking business executives and architects of the country.

Architects specializing in office modernization recommend "Y and E" "Style Master" steel desks because their modern design and balanced appearance conform with the lines of present day plans for office buildings and their interiors.

The "Styled Associate" (6900 line), illustrated more completely on pages 6 and 7 of this catalog section, has the same general streamlined design, the same smooth rounded corners and edges for comfort and harmony. These steel desks, like the executive line, are designed without legs to give greater knee space and more foot freedom. One principal difference is the base unit—instead of a recessed box base, there is an island base under each pedestal. These desks are adjustable in height to the individual's requirement.

The "Styled Suspension" (7900 line) is a complete alternate intended primarily as a general purpose line. Although this line is designed with four legs, the rounded edges and corners make it very desirable for general use. The absence of center legs allows plenty of foot freedom. The top is of the conventional flat top type with the same grade linoleum as is used on the other two lines. The top is bound with a molded white metal protection strip.

Functionalized for Flow of Work and Efficiency

Making records and having them available constitutes a big part of what is called office routine. "Flow of Work" is the term applied to the efficient handling of this important detail. Those who do the work should be so placed that there is "Line Production," a term just as pertinent to the office as to the factory. Desks and files of various types for specific jobs must be arranged so that workers get the proper advantages of light and air, also so that there will be as little back tracking as possible, thus reducing duplication of effort and simplifying supervision.

When you start to point out changes in office layout to increase efficiency, the graphic picture is necessary. To present these suggestions as vividly as possible, "Y and E," through their sales engineering department, has provided a complete floor planning outfit for presenting a comparison of the old plan and the suggested new one.

This floor planning outfit is simple. It consists of 4 elements or parts, a white sheet with inch scale on all sides to make it easy to draw up a plan of the present floor to one quarter inch scale.

A rough sketch of the suggested new layout is made. The various desks, files, etc., are cut from a sheet of gummed-back cloth showing scaled furniture. On this sheet the pieces are printed to one quarter inch scale. By the aid of a celluloid sheet placed over the old floor plan, the new plan is set up by using the cut out gummed blocks in their new proper work flow arrangement. In this way the advantages of the plans (new and old) are easily compared.

This plan visualizes the exact picture to the management. Should changes be desired, the units may be lifted off and rearranged.

For Brighter, More Liveable, More Productive Offices.

...OFFICES IN WHICH "Y and E" SERVICES ARE BEING USED

ONE of several views showing a large installation of "Y and E" "Style Master" Associate (6900 line) steel desks—part of the general offices of a large national manufacturer. These desks were selected after a thorough survey of steel desks available. Color and design made these desks their first choice.

The non-glare molded linoleum tops . . . warm gracefully rounded outside edges and corners and easy operating drawers were big factors in determining their selection.

The color harmony used throughout the general offices of this company is: Floor covering—marbleized warm tone brown. Walls—warm gray. Ceiling—flat cream. Blinds—cream.

THE offices of this large Public Utility Company are equipped with "Style Master" Associate (6900 line) steel desks. Here is shown a view of one of their Public Relations Offices. Customers come here to discuss service and arrange for contracts. This company has found color harmony a big asset, especially where the public is constantly contacted. The color scheme is pleasing and restful. Floor—two tone gray marbleized, with dark gray feature stripes. Walls—gray blue. Ceiling—same as walls, but much lighter. Blinds—ivory. The "Y and E" Neutra-Tone Gray Associate (6900 line) desks are most pleasing. Chairs upholstered in terra-cotta leather give sparkle and cheerfulness to the business atmosphere.

SPACE is often a greater problem in a large office than in a small one. When a hundred or more desks are to be placed in a given space, every inch counts. In this general office of a nationally known company, "Y and E" "Style Master" Associate (6900 line) steel desks, with their close compact construction and safety features, were most desirable. In offices of this size, color is genuinely important. Surveys show that color harmony reduces fatigue and stimulates concentration and greater effort. Floors—warm tones of browns marbleized. The walls of this and other offices of this company are a warm gray. Ceiling and blinds are flat cream.

BANKS AND HOSPITALS USE "Y and E" SERVICES—ALSO SCHOOLS

THIS large automobile service and travel club took advantage of the cooperative services of their architect and "Y and E" engineers. The result was the creation of this modern office for their customer relations. The "All Clear Beneath" feature of the 7900 line together with Neutra-Tone Gray finish and rounded top and body corners made these desks desirable for use with the public. The floor is covered with a rich deep rust carpet. The walls are a delightful beige with light tan drapes. Ceiling—an off-white cream. The Kodachrome reproduction here shows only one wing of the office.

THE office of a Vice-President of a large national manufacturing company. The selection of furnishings was made after the architect approved the color and design of "Y and E" "Style Master" Executive (4900 suite).

This office is a large one often used for group meetings and for consultations with customers. Note the "Style Master" Executive (4986) steel desk and the (4939) steel directors table and the (4987) steel book case. Floor covered with two-tone gray twistweave carpet. Walls are walnut flexwood, matched grain, natural finish. Ceiling—flat white. Blinds—light gray. The chair upholstering is an unusually pleasing light blue fabric.

ONE of the general offices of a large national manufacturer; another good example of the practical application of space saving design and flexibility of construction. Those in this office find it more convenient to have the letter drawer of the steel desk at the top of the pedestal. All "Style Master" steel desks have this interchangeable drawer feature. Many of these desks are equipped with transcribing machines in these top drawers. The desks are Neutra-Tone Gray. Floor—gray brown marbleized. Walls—are cream. Ceiling and blinds—light gray tint. Chairs—dark green mohair upholstering.

These six pictures illustrate how the "Y and E" Neutra-Tone Gray finish harmonizes with different color combinations produced by floor covering, wall treatment, drapes, etc.

Why not let us give you the benefit of our experience in planning brighter and more liveable offices.

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

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SED

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BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

MODERN STEEL DESKS BY "Y and E" FOR COMFORT AND SERVICE

STYLED EXECUTIVE LINE

THE "Style Master" Executive steel desk and companion pieces (4900 suite) illustrated on the opposite page, are truly Executive quality from the standpoint of color, design and function (harmony, dignity and useability).

The smooth harmonizing linoleum molded top is protected with rounded corner caps and a binding of white metal. This produces a streamlined effect that reduces the appearance of size. Wide Pedestals, which offer better balanced appearance, give added drawer capacity. The extra small drawer at the top of each pedestal is very useful for papers ready for dictation, reports, charts and other important active items. The Card Drawers and large cap size drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions. These cap drawers are 15½" wide inside and provide 26" of filing space for legal documents or 30" of filing space for letter size papers. The latter is accomplished by the use of an insert which makes the cross filing of two rows of letter size material possible. These desks are equipped with a receding box type base.

4986.1—66x34
Cap width Pedestals

STYLED ASSOCIATE LINE

THE "Style Master" Associate steel desk (6900 line) rounds out the Executive Line for use by Junior Executives and general office use. These desks are modern in design and there is a model available for all requirements.

There are various types of Secretarial and Typists' Models, including the fixed bed and Stow-Away type. All Letter and Cap size Drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions, and drawer positions in pedestals are interchangeable. The base unit is the island or skid type equipped with four adjustable gliders.

The models illustrated on the opposite page do not cover the entire Associate (6900 line). To better appreciate all the unusual features of this line and to check dimensions to meet specific requirements, send for the "Y and E" complete steel desk catalog.

These desks are adjustable in height to the individual's requirement.

6986.1—66x34
Cap width Pedestals

STYLED GENERAL OFFICE LINE

THE "Style Master" Suspension steel desk (7900 line) is a complete alternate general purpose line. This line is extensive, as illustrated on the opposite page.

These desks have four legs with all outside edges rounded to give greater comfort and reduces accident hazards. The conventional type Flat Top with rounded corners is used. The top is covered with the same high-grade linoleum and securely bound with a molded white metal strip for protection.

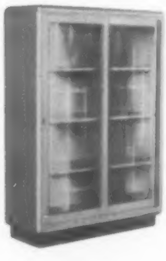
The utility features, as offered in the Styled Associate Line, are the same in this line.

Cross filing inserts are available for all letter and cap size drawers, an important time savings factor. Contents can be indexed with guide tabs facing the user.

All "Style Master" Steel Desks provide for concealed wiring so that your desk top is always free from exposed telephone buzzer and desk lamp wires.

7986.1—66x34
Cap width Pedestals

THERE IS A MODERN DESIGNED "Y and E" STEEL DESK FOR EVERY NEED



4987
Executive Bookcase

49604
Executive File

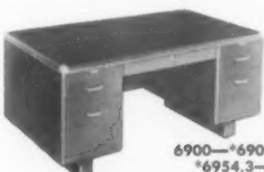
49204
Executive File "Desk-Hi"

4919
Costumer

4939
Directors' Table

4966
Companion Table

Y1900
Arm Swivel Chair



6900—*6903—60x34
*6954.3—55x34
(*3 Card Drs. L. Ped.)

SP6950.3—50x341 Cap Dr.
6921—45x341 Let. Dr.

6900RT and LT—60x34
*6904LT and RT—60x34 Card Drs.
*6954.3LT and RT—55x34 Card Drs.
(*3 Card Drs.)

6957—60x34
(For Calculating Mch.)

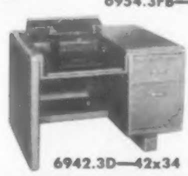
6942.3FB—42x34

6903FB—60x34
6954.3FB—55x34

6966—66x34
6934—60x34

6954.3D—55x34

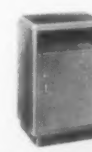
6937—72x34



6942.3D—42x34

6954.3LT or RT—55x34

The Stow-Away type of secretarial steel desk with provision for typewriter in either left or right pedestal.
To stow away typewriter—lower front of hinged typewriter platform. When folded down, it will easily ride into pedestal. Advantage — saves office space.



6940—18x18

*7900—60x34
7903—60x34
7953.3—50x34
7951.3—50x30
(*1 Cd. and 1 Let. Dr. in ea. Ped.)

7921—45x34
*7923—45x34
(*3 Card Drs. in R. Ped.)

7960.4—50x30
*7960.5—50x30
(*2 Card Drs. in ea. Ped.)

*7900LT—60x34
*7900RT—60x34
7904LT and RT—3 Cd. Drs.
(*1 Card and 1 Let. Dr.)

7903D—60x34
7953.3D—50x34

7923D—45x34

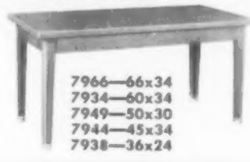
7903FB—60x34
7951.3FB—50x30

7923FB—45x34

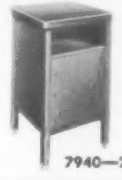
7955—45x30

7925—36x24

7937—72x34
(Two Drawers)

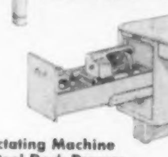


7966—66x34
7934—60x34
7949—50x30
7944—45x34
7938—36x24



7940—20x17

All Letter and Cap drawers of "Style Master" Steel desks can be equipped to house any of the dictating machines. Electric contact is broken when drawer is closed. Illustrated at right.



Dictating Machine
in Steel Desk Drawer

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

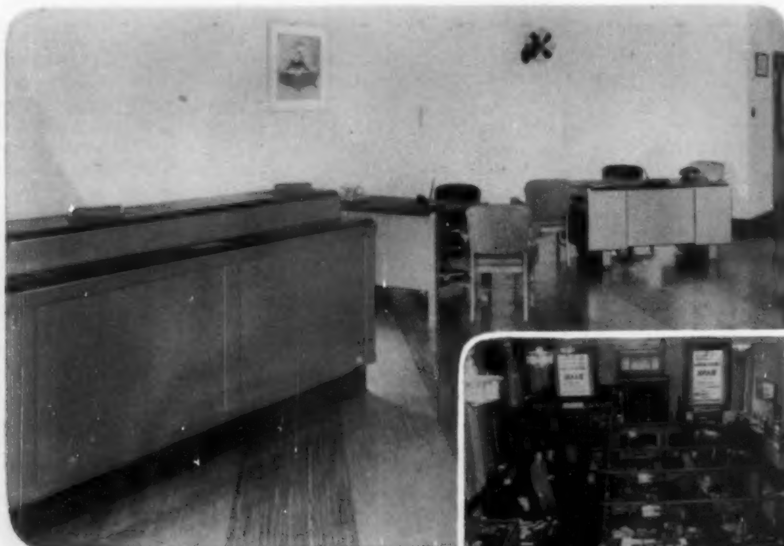
AGENTS AND DEALERS EVERYWHERE

"Y and E"

EMPIRE FILES ONE, TWO, THREE, FOUR AND FIVE DRAWERS

STREAMLINED COUNTERS

The Modern Counter is made of FILES



Counter files is the name given to all three drawer (cap and letter) height files. They are $41\frac{3}{16}''$ high and when any combination of these files is placed together, they form a practical counter at a height that provides comfortable working or consulting space. Separate tops and backs finish these counter files to meet any requirement and allow unobstructed view of the office. The counter illustrated is the latest streamlined molded top type, same as used on Executive and Associate desks. This counter creates an attractive inviting atmosphere for the public who transact business over it.

The before and after illustrations at the right show the solution to what appeared to be an expansion problem. A bank was about to enlarge its quarters because there was no longer sufficient space for their customers. Here again cooperative service between the architect and "Y and E" brought about a very satisfactory result, in the same space.

SPACE SAVING—*Before and After*

The illustration below is an example of how five-drawer files are used to advantage—note the counter files forming an aisle through the center. Where space is a factor and four-drawer files are in use, congestion can be relieved by placing one-drawer files on top.

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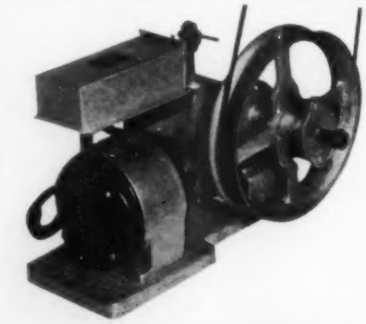

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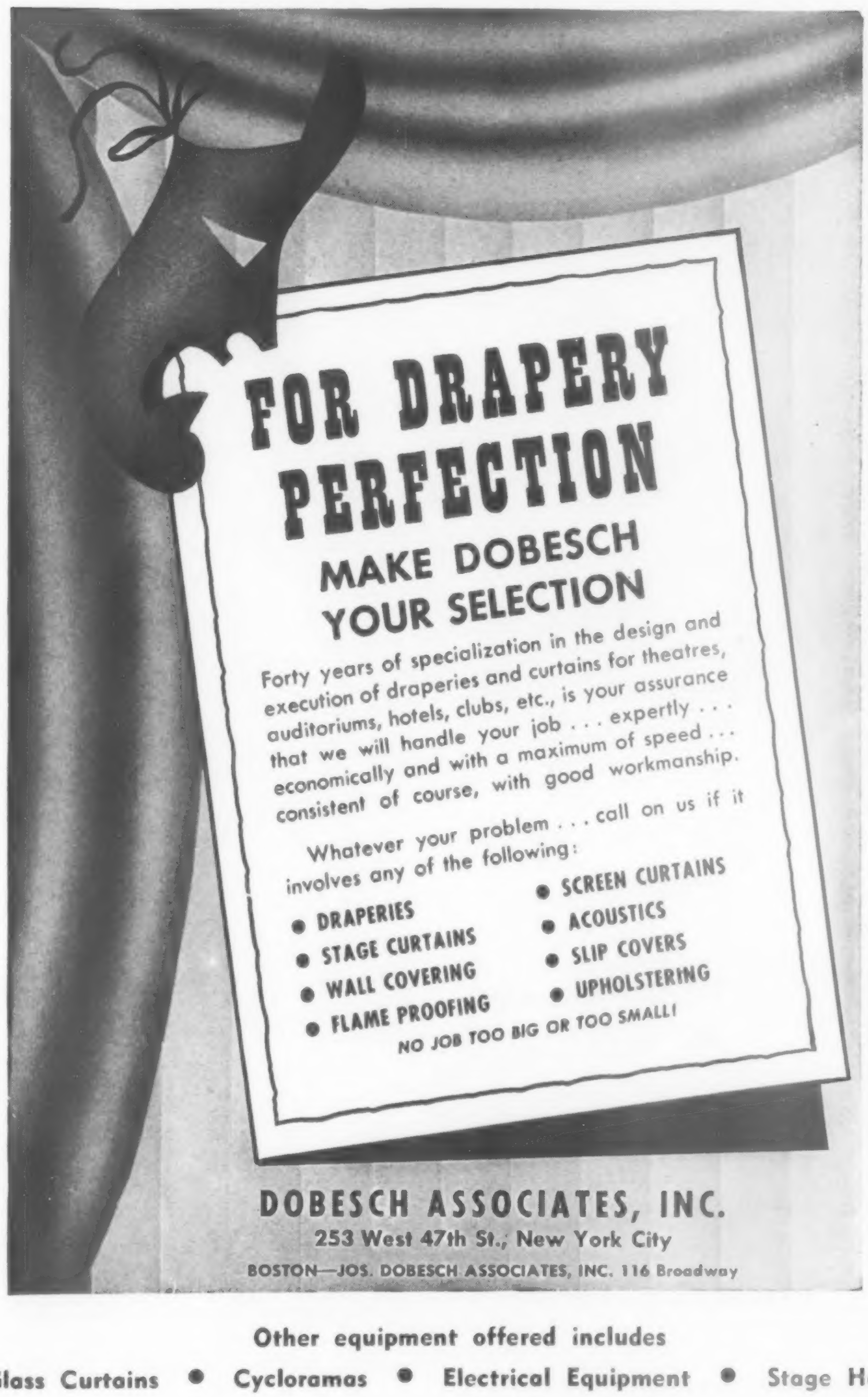

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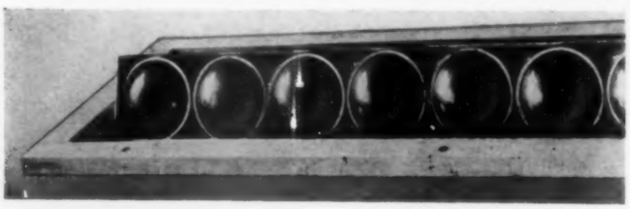

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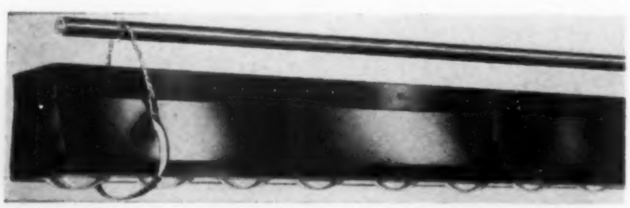
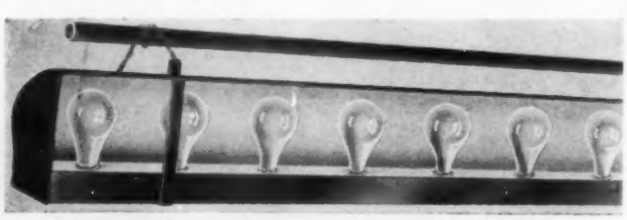


BORDERLIGHTS:

Individual reflector types with aluminum alcen finish reflectors. Red, amber, green, white or blue roundels. Chain hangers, splice box.

Cat. No.	Outlet Centers	Wattage	Ft. Price
450	6"	75-150	
455	8"	200	on
460	12"	300–500	Application

Cable clamp and cradle sets.



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White paint continuous reflecting surface, semi-open trough, chain hangers, splice box for feed cables, 25 to 100 watts.

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400	4"	6"	12"
		Ft. Price on Application	

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Elliptical reflector spotlights with built-in 4-way beam framing shutters, yoke and base or clamp; metal color frame; heat resisting condensing lens; asbestos lead.

Cat. No.	Dia. Lens	Wattage	List Price
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1591	6"	100, 250, 500	55
1581	4½"	100, 250, 500	50

No extra charge if iris shutter is substituted for 4-way shutter. Bulbs not included.

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Patented Fresnelens provides soft edge spot and flood light. Ideal for stage lighting. Equipped with spherical reflectors, focusing device, yoke, clamp or base; metal color frame, Asbestos lead.

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500	6"	250 to 500	$20
501*	8"	1000 to 1500	80
502*	10"	2000	120
503*	14"	5000	170
505-S*	6"	250 to 500	45
507	5"	100 to 400	19
508	3"	75 to 150	15.40

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* Cast aluminum top and bottom, with screw feed focusing device. 3-legged base castered stand; 4' to 7' telescopic pipe. Others are all steel bodies, with push-button type slider focusing device. No bulbs included.

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1000-1500 watts. Narrow beam with parallel rays for sunlight, moonlight, and sidelighting. 16" chromium plated parabolic reflector. 5" spherical aluminum blinder. Color frame holder.

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500-1500 watts. 6" Plano-Convex lens. Furnished with C clamp, 60-ft. stage cable, full 15-ampere connector, color frame.

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1000-1500 watts. Stand type, 14" base with 4- to 7-ft. telescopic pipe. Furnished with 25-ft. stage cable, full 15-ampere connector.

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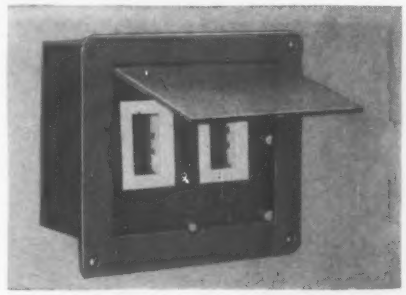

Cat. No.	Description	List Price
3101	1 way & plug	$12
3102	2 way & plugs	22
3103	3 way & plugs	32
3104	4 way & plugs	42

FLOOR POCKETS:

Cat. No.	Description	List Price
3091	1 way & plug	$12
3092	2 way & plugs	22
3093	3 way & plugs	32
3094	4 way & plugs	42

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2759	500	21
2761	1000	33
2764	2000	45
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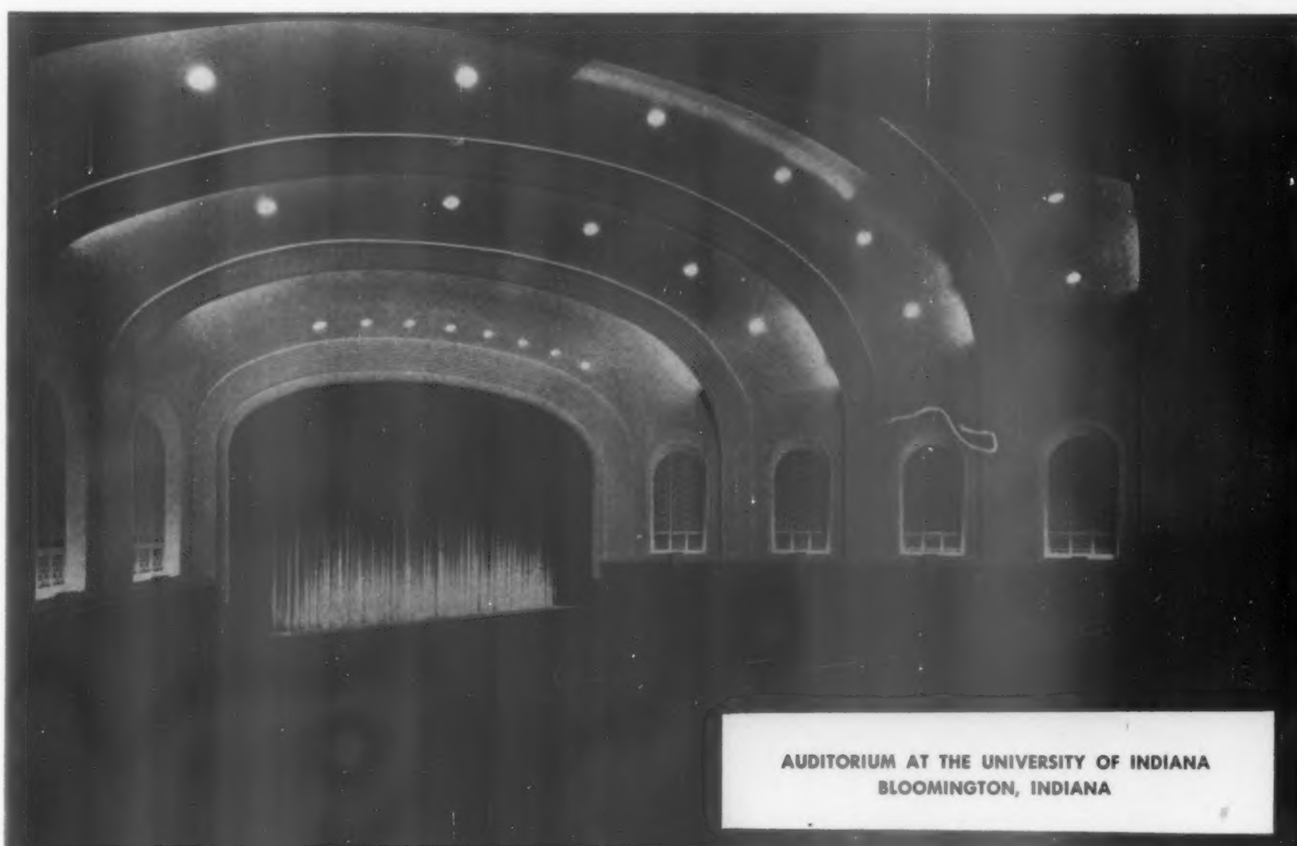
Your requests, cordially invited and thoughtfully attended. Write for particulars or submit your lighting problems for recommendations.



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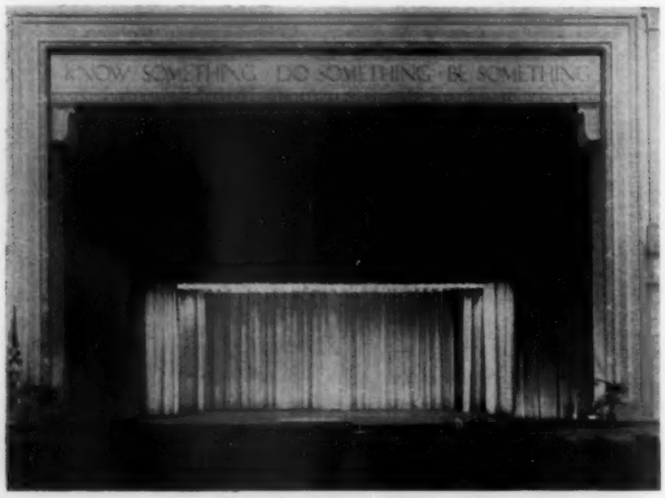

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Alliance High School—Alliance, Ohio
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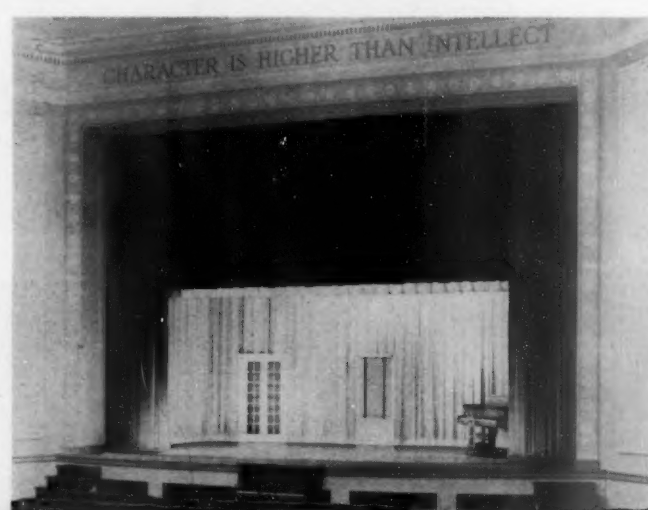

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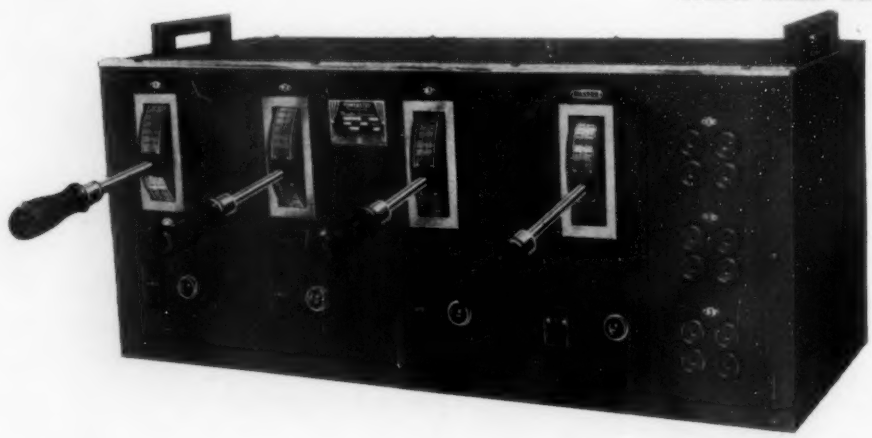

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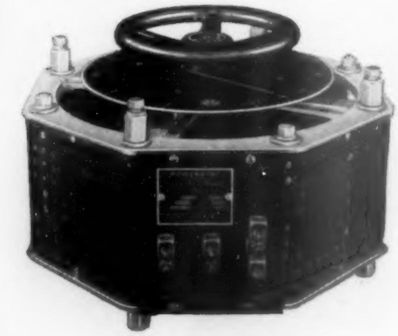

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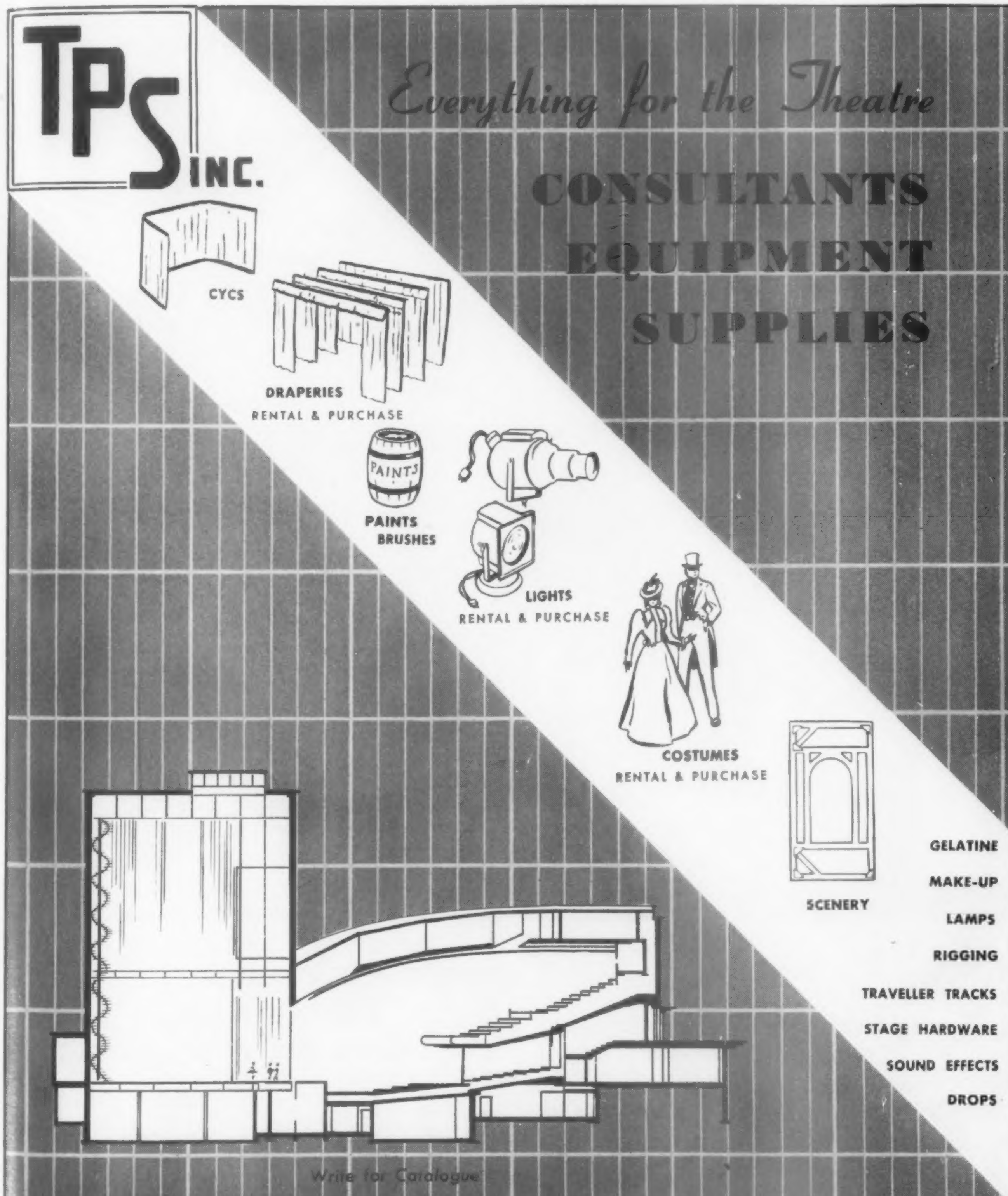

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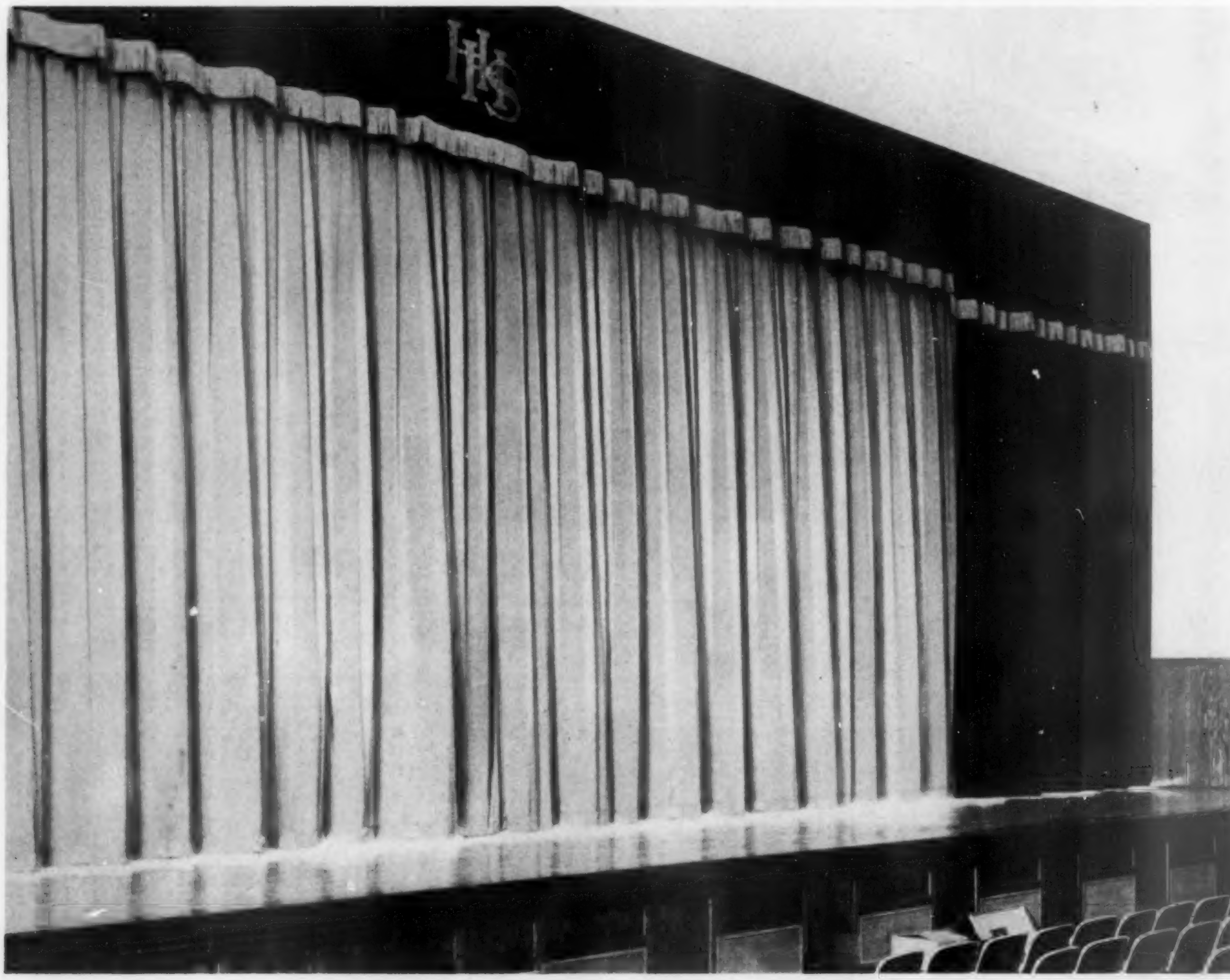

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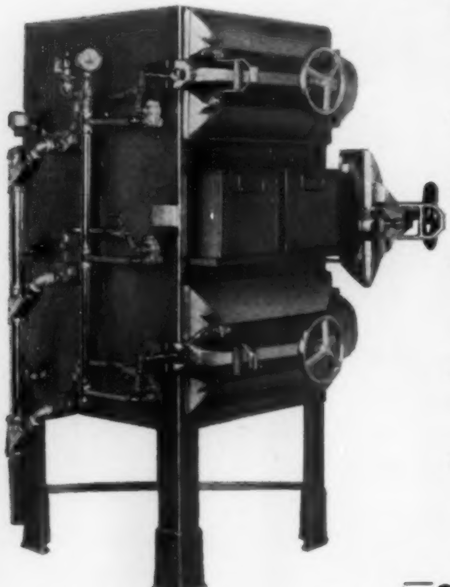

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Meharry Medical College, Nashville, Tenn.
St. Lawrence University, Canton, N. Y.
Tuskegee Institute, Tuskegee, Ala.
Stanford University, Palo Alto, Calif.
Georgia School of Technology, Atlanta, Ga.
Northwestern University, Evanston, Ill.
Purdue University, Lafayette, Ind.
Southern Baptist Theological Seminary, Louisville, Ky.
Southwestern Louisiana Institute, Lafayette, La.
Wellesley College, Wellesley, Mass.
Harvard University, Cambridge, Mass.
Michigan State College, East Lansing, Mich.
Wayne University, Detroit, Mich.
Stephens College, Columbia, Mo.
Dartmouth College, Hanover, N. H.
Princeton University, Princeton, N. J.
Cornell University, Ithaca, N. Y.
Fordham University, New York City
Hunter College, New York City
Barnard College, New York City
Vassar College, Poughkeepsie, N. Y.
Skidmore College, Saratoga Springs, N. Y.
Syracuse University, Syracuse, N. Y.
Duke University, Durham, N. C.
Baldwin-Wallace College, Cleveland, Ohio

Sacred Heart School & Convent, Pittsburgh, Pa.
Mt. Vernon Seminary, Washington, D. C.
Lincoln High School, Cleveland, Ohio
Western Reserve Academy, Hudson, Ohio
John Burroughs Jr. High School, Los Angeles, Calif.
Canterbury School, New Milford, Conn.
Admiral Farragut Academy, St. Petersburg, Fla.
Groton School, Groton, Mass.
Cranwell Preparatory School, Lenox, Mass.
Abbott Academy, Andover, Mass.
Phillips-Exeter Academy, Exeter, N. H.
Blair Academy, Blairtown, N. J.
Schneider School, Columbia, S. C.
Bremerton High School, Bremerton, Wash.

Oberlin College, Oberlin, Ohio
Wooster College, Wooster, Ohio
University of Tulsa, Tulsa, Okla.
Villanova College, Villanova, Pa.
Bryn Mawr College, Bryn Mawr, Pa.
Allegheny College, Meadville, Pa.
Bucknell University, Lewisburg, Pa.
A. & M. College of Texas, College Station, Tex.
Brigham Young University, Provo, Utah
Middlebury College, Middlebury, Vt.
Virginia Polytechnic Institute, Blacksburg, Va.
College of William & Mary, Williamsburg, Va.
Davis-Elkins College, Elkins, W. Va.

STATE UNIVERSITIES OF

Arkansas	Kansas	New Mexico
California	Kentucky	North Carolina
Colorado	Maine	Ohio
Connecticut	Maryland	Oklahoma
Delaware	Michigan	Oregon
Georgia	Minnesota	Pennsylvania
Idaho	Missouri	South Carolina
Illinois	Montana	Texas
Indiana	Nebraska	Utah
Iowa	New Hampshire	Vermont

Virginia Washington Wisconsin Wyoming

For BETTER Steaming-
STEAM-CHEF

DUKE MANUFACTURING CO.

St. Louis 6, Missouri

ECONOMIZE WITH THE *Sanitary* THURMADUKE

New Pilot Light Control

Meats—Most Vegetables: 145 Degrees

Mashed Potatoes: 125 Degrees

Soup: 180 Degrees

MADE IN MANY SIZES
PROTECTED BY U. S. PATENTS

GAS or ELECTRIC

For Sanitation—Efficiency—Economy

THURMADUKE

HAS NO EQUAL

The THURMADUKE is designed and constructed to give the utmost in efficiency of operation, together with sanitary preservation of all foods while being kept warm.

The THURMADUKE does not have the insanitary, bacteria-laden water pan used in steam tables.

The THURMADUKE operates by a sanitary dry-heat system which controls the heat in each section, making it possible, for the first time, to keep the various foods at the temperature desired. The chip-proof, glistening "35" monel interchangeable top plates are easily removed for cleaning. THURMADUKE is free from germ-laden cracks and crevices and the streamlined body with rounded corners makes it extremely easy to keep clean.

REMEMBER:
FOR SANITARY FOOD-WARMING—PLUS ECONOMY OF OPERATION
THURMADUKE HAS NO EQUAL!

MADE TO FIT INTO
YOUR PRESENT CAFETERIA COUNTER

The THURMADUKE cafeteria counter, shown above, shares all of THURMADUKE'S advantages. It may be had in any number of sections desired to fit your cafeteria counter. It embodies all the sanitary features with selective heat control for each top plate. No matter what style, or size, you may require, THURMADUKE will give you "the utmost" in sanitation and economy.

THURMADUKE IS FOR SALE BY YOUR FOOD SERVICE EQUIPMENT JOBBER
SEND FOR CATALOG NO. W-469

HOTPOINT INC.

5622 West Taylor Street Chicago 44, Ill.

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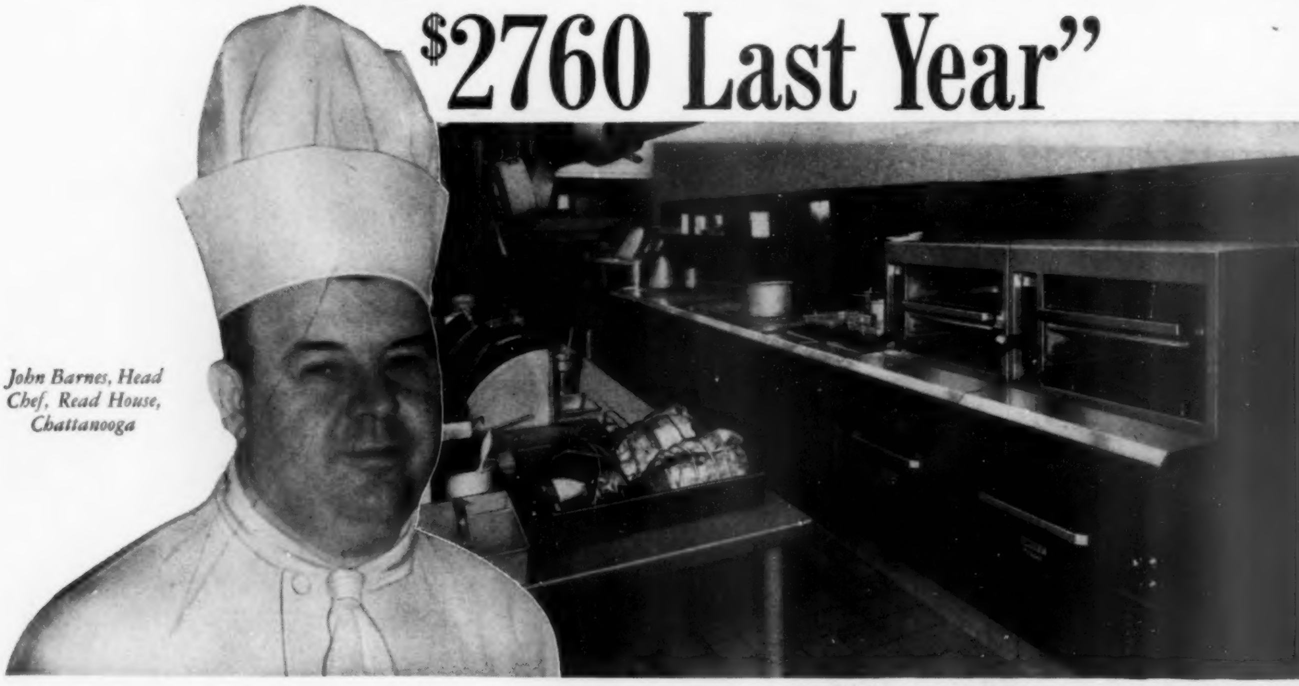
"Hotpoint Equipment Saved $2760 Last Year"



John Barnes, Head Chef, Read House, Chattanooga

Read House Kitchen, showing modern Hotpoint equipment

Chattanooga's Read House makes spectacular savings in meat shrinkage and fuel with Hotpoint kitchen

SPEED and better handling of food were sought by the Read House, Chattanooga, when it electrified both its main and coffee shop kitchens last January. But the Hotpoint Electric Cooking Equipment installed did better than that. Steadily each month the Read House has been saving a total of $230—divided between fuel cost and reduction in meat shrinkage—an overall saving of $2760 for 12 months.

Schools find that Hotpoint Commercial Cooking Equipment not only means better, more nutritious meals, but also pays for itself many times over. *Discover* for yourself how Hotpoint brings you 7 big savings every day of the week!

Save 7 Ways Every Day With Hotpoint!

1. **Saves Food Flavors** — conserves maximum of natural juices, gives uniform results.
2. **Cuts Food Costs** — reduces meat shrinkage, saves up to 60% on consumption of fat.
3. **Cuts Labor Costs** — saves hours for cook, saves on cleaning and scouring, too.
4. **Lasts Twice as Long** — Independent study shows depreciation rate is cut in half.
5. **Cuts Maintenance Costs** — Analysis shows annual costs average 1—1½% of investment for Hotpoint, 2—5% for most flame types.
6. **Saves Kitchen Space** — compact, easy to install in any arrangement without regard to chimneys.
7. **More Efficient** — Independent tests by a Midwestern university show Hotpoint equipment is 2.68 times more efficient than flame types.

START PLANNING A HOTPOINT KITCHEN TODAY!

Hotpoint

HOTPOINT INC. A GENERAL ELECTRIC AFFILIATE

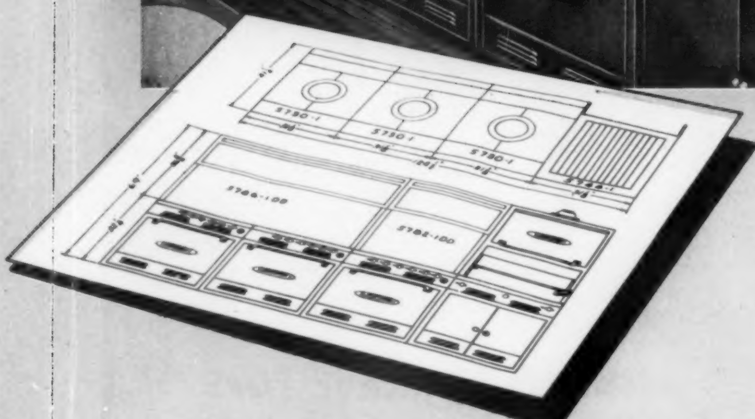
COMMERCIAL ELECTRIC COOKING EQUIPMENT

Ranges • Bake Ovens • Roasting Ovens • Deep Fat Fry Kettles • Broilers • Griddles

Sold through leading kitchen equipment distributors

Hotpoint Inc., 5622 West Taylor Street, Chicago 44, Illinois

GOOD FOOD SERVICE STARTS

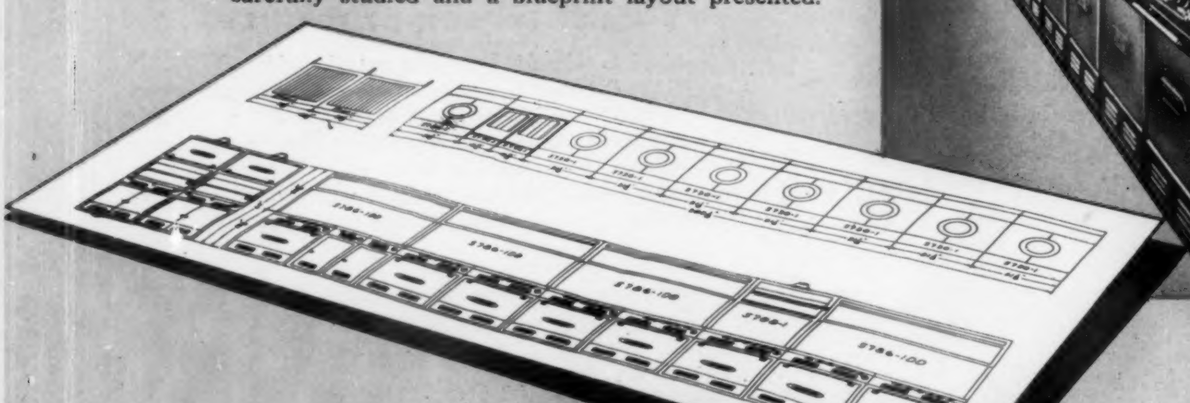


A study of the cooking needs of this institution showed the need for three VULCAN super-radial fin top ranges for stock and boiling. Each has an extra large, two compartment insulated oven equipped with automatic heat controls. Because of accurate control over roasting temperatures, meat losses due to shrinkage have been greatly reduced and savings in food and fuel are substantial. Heavy-duty ceramic broiler with au gratin oven provides excellent broiling facilities.

A preliminary survey was made—layouts were made in blue-print form. When the equipment was delivered it fitted perfectly in the space and is operating with complete satisfaction.

The cooking requirements here are adequately handled by two heavy-duty ceramic broilers at the far end. Two deep-fat fryers with automatic temperature controls are inserted between the broiler and the line-up of seven super-radial fin top ranges. In other kitchens skeleton top ranges can be substituted and oven capacity can be provided by installing one or more VULCAN roasting ovens, or sectional ovens as shown on back page of this insert. This latter method is often preferred when women cooks operate the equipment.

Again, in this case, the cooking requirements were carefully studied and a blueprint layout presented.



AT YOUR KITCHEN RANGES!

VULCAN GAS COOKING EQUIPMENT

To cook food well, your cooking crew needs good tools, the kind of tools you'll find in VULCAN gas cooking equipment. A well-balanced installation of the VULCAN cooking units shown here will give unsurpassed cooking facilities. With them your cooking crew will have the advantages of greater efficiency in top cooking service—better broiling facilities—instant, uniform, controlled heat—improved, insulated roasting and baking ovens—also scientifically designed frying equipment with automatic heat controls. The result will be better quality of food, lower cooking costs, more variety in menus, and increased dietetic value.

VULCAN SERVICE TO SCHOOLS

Every school's food service facilities must be planned to meet its individual requirements. Cooking equipment, too, must be specially selected to meet its specialized food service needs. VULCAN Planning Service is set up to provide expert guidance in selecting the best combination of ranges, broilers, ovens and specialized cooking units to meet each school or university's food service demands. On the opposite page are typical layouts produced by this service department. Below are additional hookups showing other practical combinations of VULCAN cooking units, each designed to meet special cooking requirements.

If you are planning new construction or remodelling your present facilities ask for full information about this helpful planning service and ask for a complete catalog of VULCAN cooking equipment. Write today, there is no obligation.

This typical VULCAN installation for a school cafeteria provides facilities for serving more than 1000 students per day. Shown in the illustration are: Two Super Radial Fin Hot Top ranges for ample top capacity . . . Elevated ceramic broiler . . . Two-burner Expando unit with storage compartment . . . Deep fat fryer and . . . Heavy-duty ceramic broiler with au gratin oven . . . Two large, insulated, heat-controlled ovens. All mounted on toe base. Width 124⅝ inches.

The flexibility of VULCAN cooking equipment is further demonstrated by the combination of a heavy duty ceramic broiler for broiling and toasting; Two large super-radial fin hot top ranges for stock or boiling operations; Two-burner open top; Two extra large, two-compartment, insulated, heat-controlled ovens; High shelf; Storage compartment. Complete unit is mounted on toe base. Width 109 inches.

The improved radial fin top, introduced and patented by VULCAN, has made possible savings of 20% in fuel consumed in the range top. The new ventilated ring and lid, as well as angle-drilled burner, gives increased center heat for faster heating. New blue-flame pilot lights any or all rings—really makes a 5-ring burner.

Another new VULCAN development, the Expando unit, makes it possible to add top capacity at low cost—and to retain the streamline appearance of a battery. This VULCAN feature gives flexibility. There are several types of Expando units available which fit in battery with other VULCAN ranges and equipment.

The new VULCAN deep fat fryer uses half the frying compound formerly required—gives the same high capacity service. This is made possible through increasing the area of the heat radiating surface—and incorporating in the unit a new and improved burner and heat control which assure faster heat recovery and economy.

The new VULCAN Ceramic Broiler has extra speed, large capacity and elevated oven for finishing or warming. A new Ceramic burner, with balanced heat, has been designed, retaining the speed of the ceramic burner, but improving the color of steaks, chops, fish, etc., thus meeting the requirements of exacting chefs.

The VULCAN Roasting Oven can be connected in battery as an integral or separate unit—and thus gives oven capacity of two ranges in floor area required for one. This arrangement permits a more efficient food production layout. This unit is especially useful when large oven capacity is needed and space is limited.

In the VULCAN Sectional Oven added roasting and baking capacity can be obtained by using wall space instead of adding to the floor space. The VULCAN Sectional Oven has separate burners and automatic heat controls for each deck so that roasting and baking can be done simultaneously on different decks at different temperatures.

MORE THAN 50 YEARS OF SERVICE TO SCHOOLS

VULCAN gas cooking equipment has successfully provided flexibility, completeness and unexcelled service to schools and universities for more than 50 years. The VULCAN line of gas cooking equipment includes practically every cooking unit needed for these specialized food service needs. All connections and designs are standard—and its installation, therefore, assures maximum operating efficiency with minimum operating and maintenance costs. When you install VULCAN you can rely on the same long-term superior service it is now giving to school and university kitchens from coast to coast.

Write to our VULCAN Planning Service—give us the essential facts on the job concerned. We will help you plan the layout of the cooking equipment and select the proper VULCAN units.

STANDARD GAS EQUIPMENT CORPORATION

BAYARD & HAMBURG STREETS, BALTIMORE 30, MD.

BRANCH OFFICES: NEW YORK · BOSTON · AURORA, ILL. · CHICAGO · NEW ORLEANS · LOS ANGELES

SAVORY EQUIPMENT, INC.

133 Pacific Street, Newark 5, N. J.

Savory

Conveyor-Type
STAINLESS STEEL
TOASTERS
Gas and Electric Models

For quantity production of quality toast

Model PD 6 slice per minute capacity, gas heated
Model CT-2 6 slice per minute capacity, electrically heated
Above models require only 19⅛" x 16⅝" counter space
Model PQ 12 slice per minute capacity, gas heated
Model CT-4 12 slice per minute capacity, electrically heated
Above models require only 23⅝" x 16⅝" counter space

Conveyor Principle. A continuous conveyor (a patented feature) carries bread through zones of heat (see sectional drawing) to deliver 6 to 12 slices of perfect toast per minute in the lower serving tray.

Automatic Operation. Once bread is placed in the rack, it needs no further attention because conveyor completes the toasting operation automatically and unloads itself. Thus loading end of toaster is always clear, the unloading operation is eliminated, more toast is produced with fewer motions and service is speeded up all along the line. Heat is adjustable to bread characteristics. Positive thermostatic control maintains set temperatures without further attention. Can be regulated for peak or off peak demands.

Low Operating Cost. Costs but pennies per hour to operate.

Low Maintenance Cost. Sturdy stainless steel construction, with aluminized steel structural members. Completely protected against rust and corrosion.

Fits All Needs. Gas operated or all-electric models for toasting bread, buns and sandwiches.

FOR FULL INFORMATION ASK YOUR DEALER, OR WRITE TO SAVORY EQUIPMENT, INC.

OVENS ACTUALLY DESIGNED BY FOOD DIRECTORS

The flexible design and large capacity of Blodgett Baking and Roasting Ovens are the result of long and careful investigation of the requirements of school cafeterias.

Actually, these ovens were designed by food directors who wanted efficient, space-saving equipment, so easily operated that there would be no need for long, detailed instruction every time an employee changed. They wanted easily read thermostat dials and accurate control, coupled with large capacity. They wanted to reduce the fatigue due to the bending, stooping and lifting required by old-style, conventional equipment.

To "dress up" dishes, such as individual casseroles, and to produce in quantity, without loss of quality, requires equipment specifically designed for mass production of nutritious foods. Blodgett's "just-short-of-a-century" experience in oven manufacture has produced all these features—and more!

BLODGETT OVENS AND MEAT COOKERY

Jessie Alice Cline points out in recently published articles on meat cookery that two of the factors that effect shrinkage—cooking temperature and degree of doneness—can be controlled in the kitchen. Cooking temperature is easily controlled in Blodgett sectional roasters, and the five points named by Miss Cline as the advantages of constant oven temperatures are easily achieved, namely: "(1) less shrinkage; (2) less fuel; (3) easy to control and to duplicate; (4) less watching; (5) less spattering and burning of fat, pans and racks."

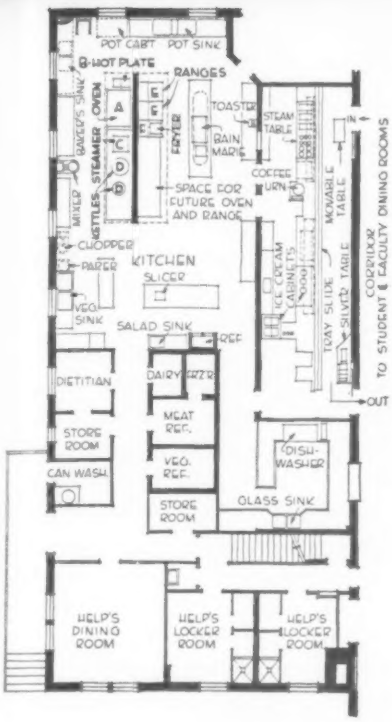
Not only can meats, fish and poultry be done more easily when removed from beneath the range tops, but many foods, such as casserole dishes, stews, baked hamburgers, bacon and the like, are more easily prepared, **and with huge savings!**

BLODGETT OVENS AND VEGETABLE COOKERY

Vegetables essential to the "Basic 7" nutrition program are now easily prepared in sectional ovens, with greater appetite-stimulating attractiveness. Literally hundreds of dishes rarely attempted before, because of equipment limitation, are now common menu items. Individual casserole dishes, spinach loaf, baked celery, summer squash, baked tomatoes, baked carrots, baked corn, eggplant, baked parsnips, onions, potatoes, turnips, and au gratin dishes are but a few. In addition, a large number of meat substitutes are now easily prepared, thanks to the large capacity and facile operation of Blodgett Roasting or Baking Ovens.

BLODGETT OVENS AND BAKING

Authorities state that desserts are as important to good nutrition as the principal food items themselves. Premises-controlled desserts, prepared under the supervision of the school dietitian, meet exactly the nutritional requirements of students. **Adequate menu variation** of desserts and the ever-popular hot breads and biscuits, so essential to school nutritional programs, are assured. Blodgett Sectional Ovens, with their separate controls, actually function as **two or more** ovens in the same floor space—producing with variety, quality—and on time!



No 1 THIS COLLEGE KITCHEN FEEDS 800 STUDENTS

This plan was conceived to feed 800 persons at the Nurses School, Adelphi College, Garden City, New York. It was designed by A. J. Amendola of Nathan Straus-Duparquet, Inc. and installed by the Federal Manufacturing Co., Brooklyn, New York.

Equipment Used

(a) 1 NO. 959 BLODGETT COMBINATION BAKING AND ROASTING OVEN
(b) 1 gas-fired hot plate
(c) 1 vegetable steamer
(d) 2 stock kettles
(e) 1 gas-fired solid top range
1 gas-fired fry top range
1 gas-fired salamander
(f) 1 gas-fired deep fat fryer

An interesting feature is the space allotted for **future** equipment. The basic menu consists of one soup, a main hot dish, vegetable plate, three salads, three sandwiches, several desserts, beverages. Three meals daily are served to students, faculty and staff.

PRATT INSTITUTE, Brooklyn, New York, serves 300 students daily with this battery of equipment. A major unit is the No. 963 Blodgett Oven, used simultaneously for baking and roasting.

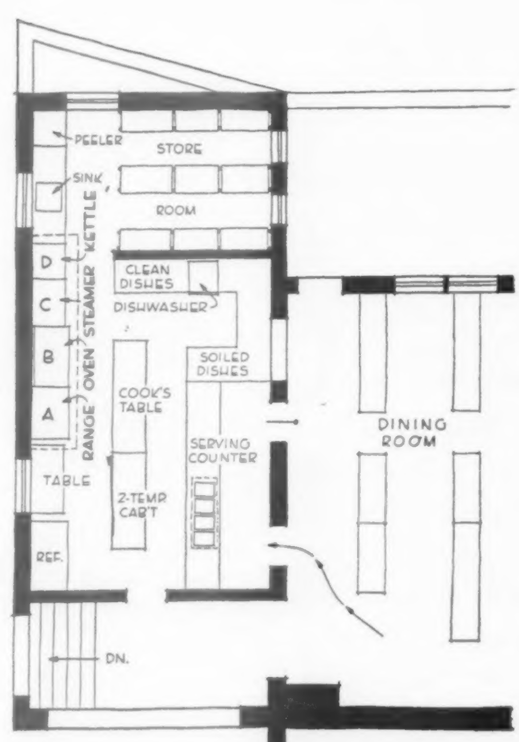
"SPECIALIZED COOKING TOOLS" IN A MARYLAND HIGH SCHOOL No 2

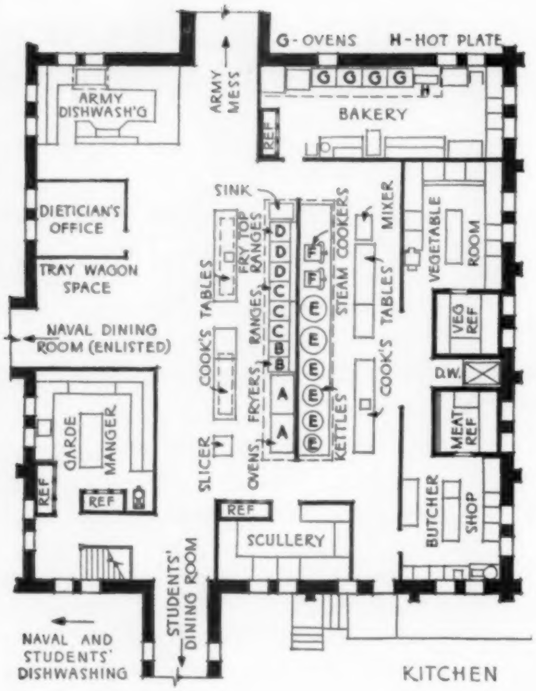
This Cumberland, Md., high school kitchen, an excellent example of modern "cooking tool" layout, was designed and installed by the Bernard Gloekler Corporation, Pittsburgh, Pa.

The flexibility of modern equipment and the excellence of kitchen design incorporated in this plan permits the serving of substantial hot meals to 600 students daily, with clocklike precision. All cooking functions except the baking of bread are performed on premises.

Equipment Used

(a) 1 gas-fired heavy duty range
(b) 1 No. 959 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN
(c) 1 vegetable steamer
(d) 1 stock kettle





N° 3

A COLLEGE SERVES 6000 DAILY MEALS

This kitchen space was redesigned and its equipment installed by A. Mathesius of H. F. Rutley Company, Inc., Brooklyn, New York, according to the plan at left, to increase the food services from a few hundred daily to more than 6000.

Equipment Used

(a) 2 No. 952 BLODGETT GAS-FIRED ROASTING OVENS
(b) 2 gas-fired fryers
(c) 3 gas-fired ranges
(d) 3 gas-fired fry tops
(e) 6 stock kettles
(f) 2 vegetable steamers
(g) 4 BLODGETT GAS-FIRED BAKE OVENS
(h) 1 gas-fired hot plate

The basic menu consists of two soups, 1 meat, 2 vegetables, hot breads, desserts and beverages. The two No. 952 Blodgett Gas-Fired Roasting Ovens accommodate 800 lbs. loading capacity in four separately controlled sections. The four Blodgett Gas-Fired Multiple Deck Ovens furnish ample and flexible capacity for premises-controlled baked goods and desserts.

U. S. NAVAL TRAINING STATION (WR), Bronx, New York, used this battery of five No. 959 Blodgett Ovens to furnish efficient and adequate roasting capacity for 17,000 husky naval meals daily.

N° 4

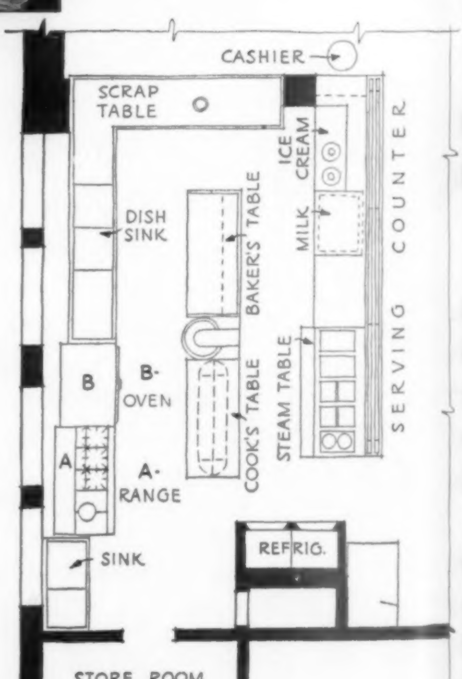
A SMALL SCHOOL FEEDING UNIT

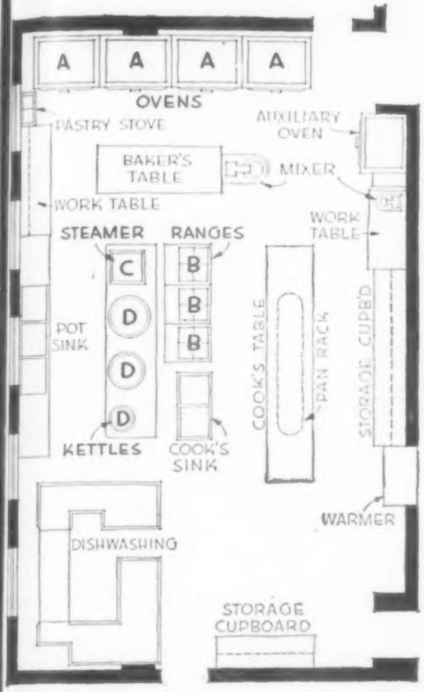
Kitchen plan of Guilford School, Cincinnati, Ohio, designed by H. Lauber & Co., Cincinnati, Ohio.

Feeding 300 school lunches daily with a basic menu consisting of soup, meat, fish or meat substitutes, three vegetables and two to three desserts, is an easy matter with this flexible, modern kitchen layout. The No. 932 Blodgett Oven is used for baking, roasting, vegetable cookery and pudding work.

Equipment Used

(a) 1 solid top gas-fired range
1 open top gas-fired range
(b) 1 No. 932 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN





Nº5 HIGH SCHOOL SERVING 4300 STUDENTS DAILY

To serve 4300, of whom 2490 (58%) eat hot meals, this kitchen at Withrow High School, Cincinnati, Ohio, was designed and installed by H. Lauber & Company, Cincinnati, Ohio.

The basic menu consists of soup, two meats, potatoes, potato substitutes, 3 vegetables, 8 to 18 salads, 5 or more sandwiches, 3 to 5 pies, cake, custard, two or more puddings, fresh fruits, ice creams and jello.

Equipment Used

(a) 4 four-compartment, two-section BLODGETT GAS-FIRED BAKING AND ROASTING OVENS

(b) 3 open top gas-fired ranges

(c) 1 vegetable steamer

(d) 3 stock kettles

FOOD TRADES VOCATIONAL HIGH SCHOOL, New York, recognizes the importance of modern equipment, as well as modern methods. This battery of Blodgett Ovens is used for training student bakers.

COMPACT KITCHEN AT THE UNIVERSITY OF VERMONT Nº6

Incorporating highly specialized cooking and service "tools," this kitchen at Robinson Hall, University of Vermont, was designed by H. P. Rung, kitchen equipment consultant of Nathan Straus-Duparquet, Inc., New York.

Serving several hundred students daily the following basic menu is used: one soup, one meat, one entree, three or four vegetables, rolls, muffins, cake, pies, baked desserts, baked custards, cooked fruit, jello and beverages.

Equipment Used

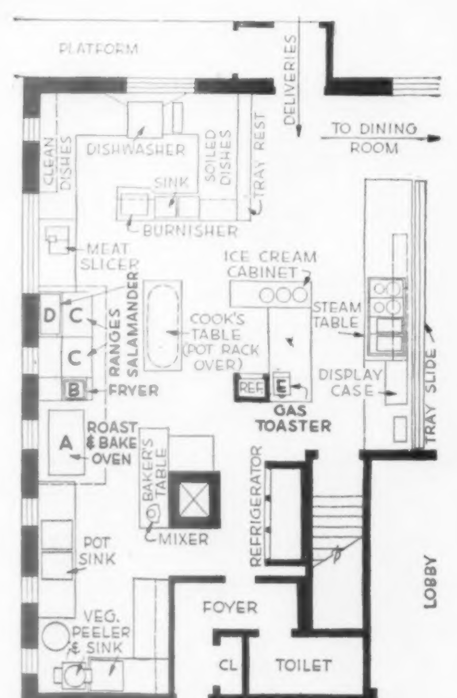
(a) 1 No. 959 BLODGETT GAS-FIRED ROASTING AND BAKING OVEN

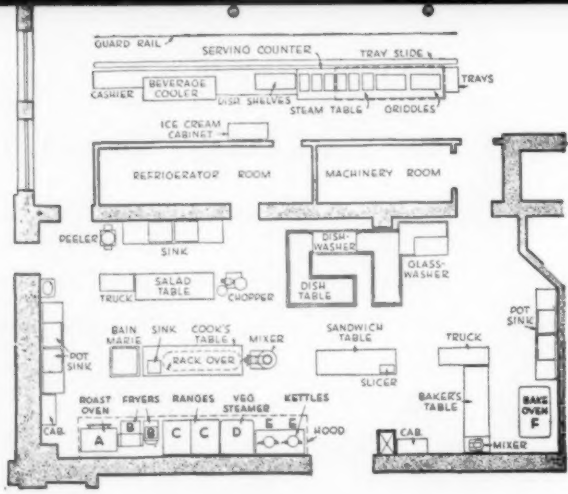
(b) 1 gas-fired deep fat fryer

(c) 2 heavy-duty gas-fired ranges

(d) 1 gas-fired salamander

(e) 1 gas-fired toaster





N°7 CHICAGO HIGH SCHOOL KITCHEN DESIGN

This kitchen at the Englewood High School was designed by the Board of Education, City of Chicago. John C. Christanson, architect, working with F. O. Washam, Director of Lunchrooms, laid out the plan. Alex Janows & Co., Chicago, installed the equipment.

With its modern layout and equipment, this highly flexible kitchen serves 3,100 students one hot meal each school day. Daily menus are highly diversified and include roasts, meat substitutes, fish, baked vegetables, pies, cakes, hot breads, rolls, muffins, and pastries. Outstanding feature of the menu is the constant variation and attractiveness of the dishes.

Equipment Used

(a) 1 No. 952 BLODGETT GAS-FIRED ROASTING OVEN
(b) 2 gas-fired deep fat fryers
(c) 2 heavy-duty gas-fired ranges
(d) 1 vegetable steamer
(e) 2 trunnion kettles
(f) 1 No. 982 BLODGETT GAS-FIRED BAKING OVEN

Major unit of this modern, gas-fired cooking equipment, which replaced a 6' stoker-fired coal range at Manhattan College, Bronx, N. Y., is this No. 952 Blodgett Roasting Oven. Baking is handled in a separate bakeshop by a Blodgett Baking Oven.

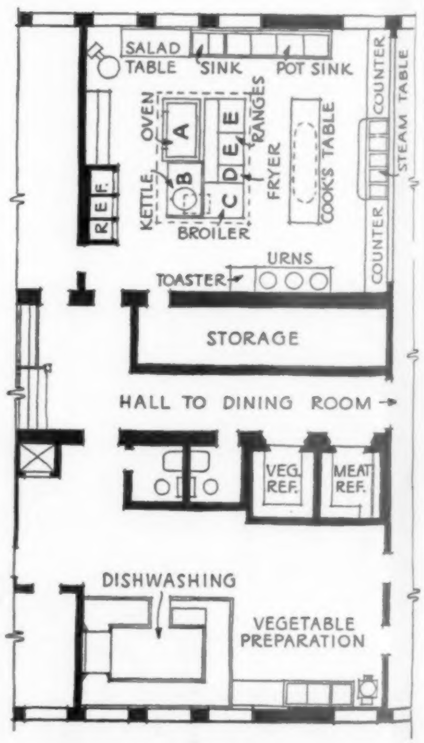
N°8 SUCCESSFUL UTILIZATION OF VERY LIMITED SPACE

Kitchen of Marmion Military Academy, Aurora, Ill., designed by the Stearnes Company of Chicago, Ill.

Serving approximately 1000 meals daily to 350 students, it exemplifies the flexibility and large capacity of modern equipment—factors which make feasible the efficient utilization of limited floor space. The roasting section of the oven, for example, is equipped for the use of an extra removable shelf which doubles the compartment capacity.

Equipment Used

(a) 1 No. 959 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN
(b) 1 stock kettle
(c) 1 gas-fired broiler
(d) 1 gas-fired fryer
(e) 2 gas-fired ranges



SECTIONAL GAS-FIRED OVENS DESIGNED TO FIT THE JOB!

THE COOKING JOB

There are literally hundreds of dishes on school menus today for which the large capacity, extreme flexibility and easy operation of the sectional roasting oven may take credit—dishes that would be, to say the least, difficult to prepare, or lacking in student appeal, without these efficient units.

More savory roasts with considerably more portions per pound, casserole dishes, baked vegetables, oven-prepared "gravy meats," oven-done bacon, fish, hamburgers and dozens of puddings are now **quantity**-produced with ease and profit.

These ovens are labor-saving; they eliminate fatigue caused by unnecessary lifting, stooping and bending, as well as knee-high heat discomfort. They save floor space and cut down fuel cost and ventilation requirements. Functioning under accurate heat control, each section can be depended upon for continuously recurring exactitude in results.

THE BAKING JOB

In all school feeding installations—small or large, high school or college, rural or metropolitan, urban or suburban—bakeshops should be planned as an integral part of the feeding operation.

All authorities agree upon the importance of desserts to the diet; the value of good rolls, biscuits, hot breads and muffins would be questioned by few. Premises-controlled, freshly baked products stimulate appetite and make otherwise wearisome menus satisfying.

In hundreds of installations, from small schools where roasting and baking are combined in single units to large high schools and colleges, Blodgett Sectional Gas-Fired Ovens are in daily use, providing a high percentage of the nation's schools with premier puddings, desserts and rolls and breads.

Blodgett Ovens are designed around three basic oven sections in two shelf sizes:

	A « Shelf Size	» B
Single 7″ compartment	33″ x 22″	42″ x 32″
Double 7″ compartment	33″ x 22″	42″ x 32″
Single 12″ compartment*	33″ x 22″	42″ x 32″

*Fitted for extra removable shelf

THE KITCHEN-BAKESHOP DESIGN

The advantage of this design lies in the fact that the kitchen designer may now "tailor-make" an installation exactly to suit requirements, and yet use standard equipment with which to do it. These combination baking and roasting ovens do away with the onerous task of roasting and vegetable cookery beneath range tops and in its place, provide the ease, convenience and unexcelled flexibility of oven operation for baking and dessert preparation.

JOHN E. SMITH'S SONS CO.

50 Broadway, Buffalo 3, New York

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

SAVE TIME AVOID WASTE and REDUCE EXPENSE

in your Kitchen with

Buffalo

KITCHEN MACHINES

Mechanical units in school and university kitchens must be economical in both initial and maintenance costs and should render many years of efficient service. They must save time, reduce food waste, meet stringent sanitary requirements and prove a definite help in the preparation of healthful and attractive menus. The Buffalo products shown here are designed to meet . . . and have met . . . every condition of economy and utility required by the most rigid school and university specifications. There are other Buffalo labor-saving machines that meet many modern kitchen needs. They are described in our Catalog. Write for a free copy today.

BUFFALO Meat and Vegetable Cutters

SPECIFICATIONS

No.	Bowl Size	Capacity
321	21 in.	20-25 lbs.
217-D	17 in.**	15 lbs.
111-D*	15 in.**	10-12 lbs.
114*	14 in.**	7 lbs.

** Also made in bench type without pedestal. ** Bowl is removable.*

BUFFALO Self-Emptying Meat and Vegetable Cutter Model 120

The machine of 100 uses in the kitchen. The only self-emptying model made. For fine chopping of all kinds of meats and vegetables. Its 20" non-removable bowl holds 20 lbs. of fresh meat. Eliminates hands contacting foods. Safe and sanitary.

BUFFALO Bread Slicer (Model 1-A)

OTHER MODELS

NO.	MAXIMUM LOAF SIZE
1½	5¾" x 5" x 23"
2-A	7" square x 26" long

All models either power or hand driven.

Saves time by eliminating hand-slicing. Cuts more slices per loaf, all uniform. Saves from 4 to 6 slices per loaf. Automatically fed, sliced and stacked. Thickness of slice adjustable from ⅛" to ⅞". Model 1-A maximum loaf size 4¼" x 5¼" x 22".

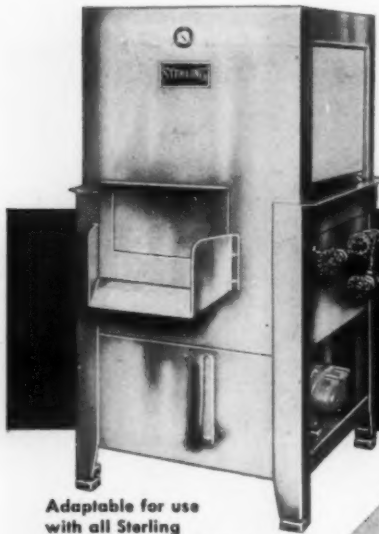
JOHN E. SMITH'S SONS CO
SAUSAGE MACHINERY

Buffalo

QUALITY KITCHEN MACHINES

THE ANSTICE COMPANY, INC.

111 Humboldt St., Rochester 9, N. Y.



New!

Model 2 Hydro-Scrap Pre-dishwashing machine. For the removal of unconsumed food from dishes and silver prior to mechanical washing.

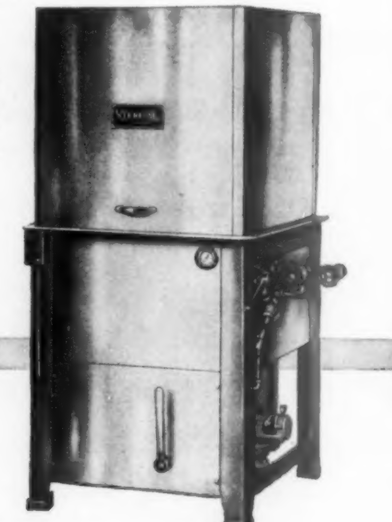
Adaptable for use with all Sterling Dishwashing Machines.

Model DS-50 Door-type, manual rinse. (DS-40 similar but with 16" x 16" racks—ideal for smaller capacity needs or as glasswasher.)

STERLING

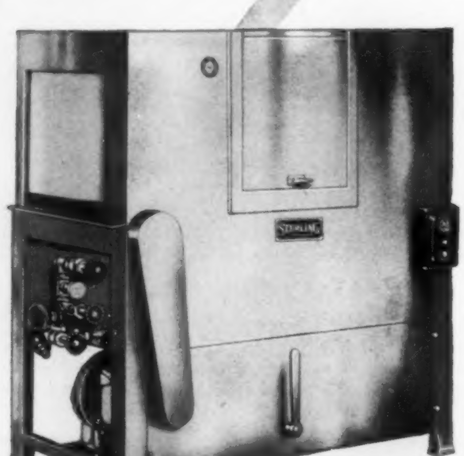
REG. U.S. PAT. OFF.

The Standard of Quality



EXCLUSIVE 3-WAY DOOR Front, Exit and Entrance sides Open Simultaneously with One Hand, One Handle, on front of machine.

STERLING DISHWASHING MACHINES



Model C-1-AD single tank type, fully automatic.

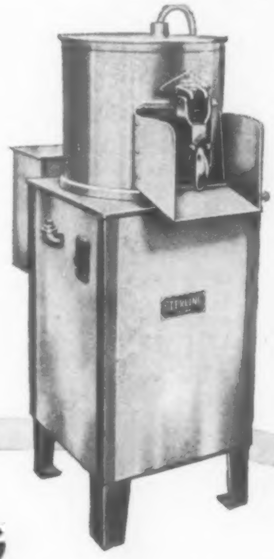
Inspection of Sterling Dishwashing Machinery is convincing proof of its unsurpassed manufacturing quality and outstanding design. Heavier, finer construction is evident throughout. 3-WAY DOOR, Hydraulically Balanced Double Suction Pump, and the new HYDRO-SCRAP Pre-dishwashing machine are included among many exclusive features and new models for greater efficiency, convenience and dependability. Institutions of every kind find Sterling equipment ideally suited to their exacting requirements.

Model 2A-100 two-tank type, automatic conveyor.

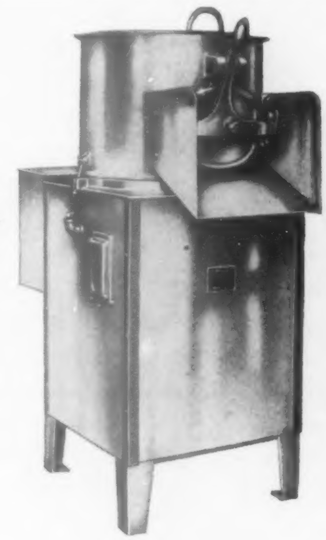
DISHWASHING MACHINE MODELS AND SPECIFICATIONS

Model	*Type*	*Motor H.P.*	*Length Between Dish Tables*	*Average No. of Dishes Per Hour under average conditions*	*Average No. of Persons Per Hr.*
DS-40*	Door, Manual	½	22"	750	50-100
DS-50*	Door, Manual	¾	27"	1350	70-175
TA-50	Door, Timed Automatic	¾	27"	1350	70-175
MM-50	Curtain, Single Tank Manual Rinse	¾	39"	1350	70-175
C-1-AD	Auto. Conveyor Single Tank	1½	44"	3450	225-425
C-2-A	Auto. Conveyor Single Tank	2	54"	4200	325-475
2A-60	Auto. Conveyor Two Tank	1½	60"	3750	300-475
2A-100	Auto. Conveyor Two Tank	2	64"	4650	400-600
2A-175	Auto. Conveyor Two Tank	3	76"	6300	500-700
2A-250	Auto. Conveyor Two Tank	5	96"	9300	700-1200

*Also Available for Corner Operation.



Type A1
with Built-in Peel Trap.



Type A1C
with Built-in Peel Trap.

STERLING VEGETABLE PEELERS

Sterling Peelers are built to outlast and outperform in the institutional field. Superior design features are backed up with solid, high-grade materials and quality workmanship. The patented "Wavy Disc" which prevents flats and saves waste is genuine Carborundum-fused-to-cast-iron. The Cylinder is genuine Carborundum-fused-to-cast-iron or bonded-to-steel. All roller bearings run in oil. Power is delivered through Silent V-Belt Drive and Power-flo Tapered Bronze Disc Clutch. Various trap and chute arrangements permit compact, convenient installation and discharge into vegetable sink. Lacquered or stainless steel finish is optional.

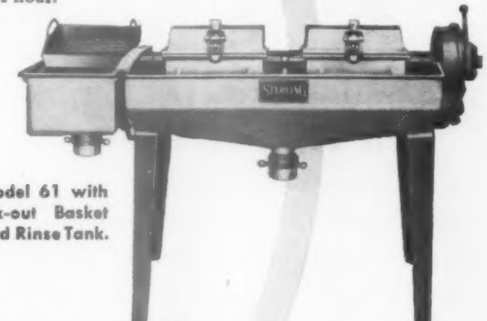
PEELER MODELS AND SPECIFICATIONS

Model	*Capacity lbs.* Per Charge*	*Floor Space With Trap*	*Motor H.P.*
A1-15	15	15¾" x 26¼"	¼
A1-30	30	18¼" x 28¾"	½
A1-45	45	22½" x 32½"	¾
A1-60	60	22½" x 33¼"	1
A1C-15	15	15¾" x 26¼"	⅓
A1C-30	30	18¼" x 28¾"	¾
A1C-50	50	22½" x 33¼"	1
A1C-60	60	22½" x 33¼"	1½
A1C-70	70	22½" x 33¼"	1½

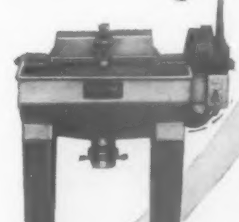
*Average peeling time 1¼ min. per charge, 15 to 20 charges peeled per hour.

STERLING SILVER BURNISHERS

No finer silver burnishers made for institutional use. Long life and efficient operation under the most extreme conditions guaranteed. Safety is unsurpassed, the exclusive Pik-out Basket eliminating "feeling thru" burnishing balls for silver. Built-in rinse tank (Models 60 and 61). Clutch and barrel locking arrangement.



Model 61 with Pik-out Basket and Rinse Tank.



Model 57

Model 58

BURNISHER MODELS AND SPECIFICATIONS

Model	*Size Burnishing Barrel*	*Floor Space*	*Motor H.P.*
57	8" x 12"	28" x 26"	¼
58	8" x 24"	41" x 26"	¼
60	9½" x 12"	42" x 26"	¼
61	(2) 9¼" x 12"	61½" x 26"	¼

WRITE FOR CATALOG INCLUDING DATA ON HEAVY DUTY VEGETABLE DICERS

FEARLESS DISHWASHER CO., INC.

Manufacturers of Dishwashers and Kitchen Equipment

Rochester 2, N. Y.

ESTABLISHED 1900

MODERN · EFFICIENT · DURABLE

These words apply in every respect to FEARLESS Dishwashing equipment. Pioneers in the dishwasher field, this company, with more than forty years' experience in fabricating this equipment, has constantly kept pace with changing requirements and now offers equip-

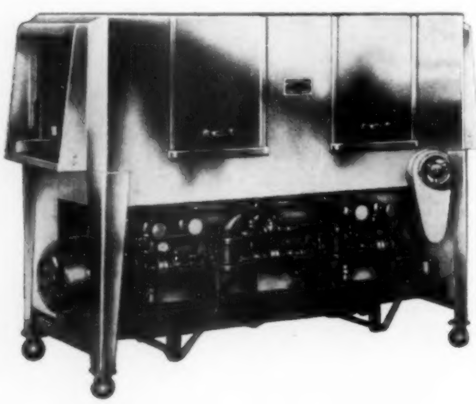
FEARLESS DISHWASHER SYSTEM

ment in harmony with the modern kitchen of today.

Today's FEARLESS Dishwashers are easy to operate and are highly efficient. The dishes are sterilized—an advantage impossible when dishes are washed by hand.

Designed also by our Engineers are dish tables and other equipment with all of the modern conveniences.

All equipment is constructed to give long years of hard service.



TWO TANK AUTOMATIC CONVEYOR

For Schools Serving 1,000 or More

This double tank, fully automatic model is as easy to operate as any of the smaller models.

Wash and rinse tanks are separated by an air space so that independent water temperatures can be maintained. Suitable baffles prevent wash water from mixing with rinse water. A separate high volume centrifugal water pump is attached to each tank. Motor, pumps and worm drive reduction unit are mounted on the same cast iron base and direct-connected with flexible couplings. The conveyor chain is equipped with a positive action clutch that stops the chain if the racks jam in the machine. The machine is equipped with a final automatic rinse to insure immediate drying of the dishes. A beautiful, soundly engineered machine, this FEARLESS Dishwasher has no superior in simplicity and ease of operation, low operating cost and smooth, quiet operation. CAPACITY: 12,000 pieces per hour.

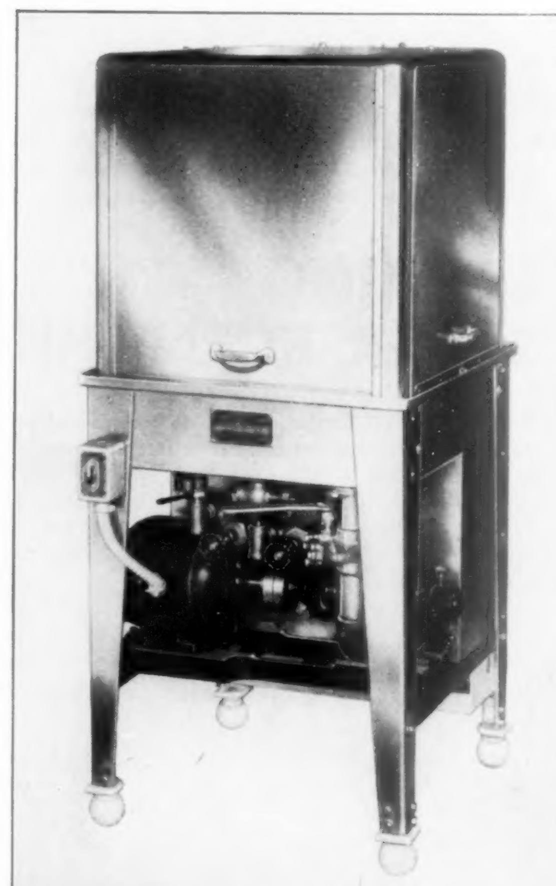
Write for complete specifications on either of these machines, or submit your special problems to us.

SINGLE TANK HAND FEED

For Schools Serving About 300 Per Meal

This single tank model featuring sturdy construction, simplicity of design, ease of operation, moderate cost and low operating expense is proving the most popular unit of its type on the market. Washing and rinsing operations are accomplished through use of a single lever conveniently located on the front.

See circular describing other special features.



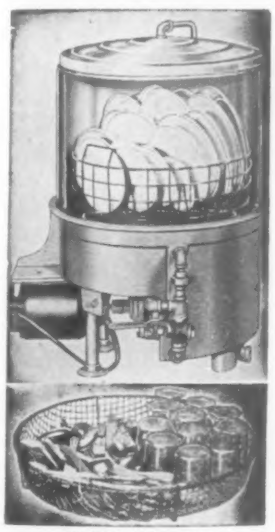
THE JACKSON DISHWASHER COMPANY

3703 East 93rd Street — Cleveland 5, Ohio

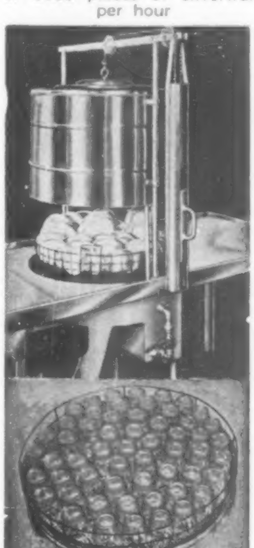
Dishwashing Specialists Since 1925

JACKSON DISHWASHERS

FOR FAST, DEPENDABLE SERVICE AND ASSURANCE OF THOROUGH SANITATION



MODEL NO. 1-A
Ideal for average school cafeteria or lunch room. Capacity, 1200 dishes, 2000 glasses or 5000 pieces of silverware per hour



MODEL NO. 2
Larger machine for high-speed, heavy duty assignments. Capacity 4000 dishes per hour. Accommodates cafeteria trays as well as all other eating utensils

Jackson Dishwashers are ideal for school installation. Their compact design enables conservation of valuable space. High-speed performance cuts dishwashing time, lowers labor expense. Other outstanding features give the user *better* dishwashing at *less* cost. Jackson Dishwashers have set the standard of efficiency and rugged dependability in schools and other places where food is served for the past 23 years.

● **EXCLUSIVE WASHING OPERATION.** Centrifugal pump *recirculates* wash water from wash reservoir through double spray arms revolving in opposite directions—thus spraying water at high pressure against dishes from every angle. This recirculation assures thermal stability, permits use of less hot water, and less detergent.

● **EXCLUSIVE RINSING-SANITIZING OPERATION.** Separate revolving sprays rinse with fresh water from rinse reservoir. Rinse water replenishes wash water, thus causing greasy water to escape through overflow. This leaves wash water clean and hot for next washing, thus making it possible to alternate a basket of glasses with a basket of greasy dishes, and yet have them come out sparkling clean. (Rinse water should be supplied at temperature not less than 180° F. Electric immersion heater and thermostat control can be furnished to maintain this temperature.)

● **EASY TO OPERATE.** Simply slide baskets in one side of machine and out the other. Dishes are not handled from start to finish of washing—rinsing—sanitizing operation.

JACKSON offers you a complete line of dishwashing equipment and accessories, including dish tables made to your individual requirements.

WRITE TODAY to Dept. AS for full information and prices on all models.

WASHING OPERATION
Revolving sprays cover every square inch, removing all particles of food and grease

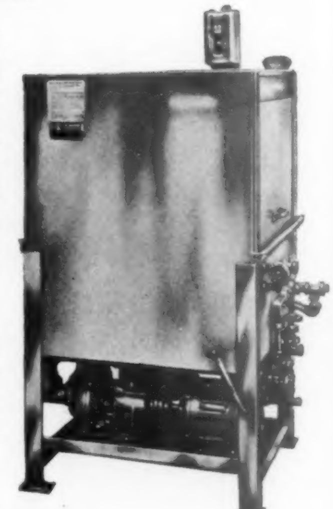
RINSING-SANITIZING
Separate rinse sprays thoroughly rinse and sanitize with fresh, hot water

UNIVERSAL DISHWASHING MACHINERY CO.

Nutley 10, New Jersey

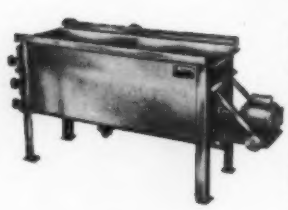
18 MODELS TO CHOOSE FROM . . . A SIZE TO HANDLE THE NEEDS OF THE SMALLEST SODA FOUNTAIN TO THE LARGEST KITCHEN

YES, SIR! A happier kitchen can be secured by having a new Universal Dish Washing Machine installed. Various sizes of these machines will wash from 2,500 to 30,000 pieces (1,250 to 15,000 dishes) per hour. Operation is either automatic or semi-automatic depending on which type of machine fits your needs. They are all welded steel construction and all models can be obtained in heavy galvanized steel or stainless steel. Tanks are excellently welded on the outside and solder is heavily flowed on the inside, giving tanks unusually long life. Supporting legs on all models are made of heavy, hot rolled steel, electric welded to dishwasher, and have adjustable feet.

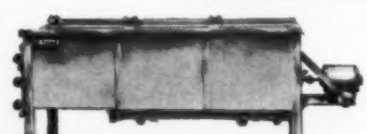


MODEL U—One tank, push through (curtains). Floor space 28 x 34½. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.

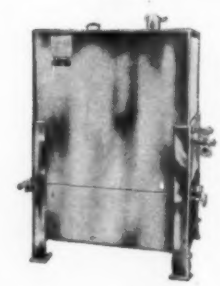
MODEL M — One tank, straight through (doors). Floor space 28 x 30. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.



MODEL T2 — Two tanks, immersion. Floor space 20½ x 48½. 4,000 pieces or 2,000 dishes per hour. Motor ¼ h.p. Wash tank capacity 20 gal.; rinse tank capacity 20 gal.; pump capacity 300 gal. Four 14 x 18 racks.



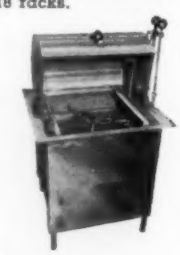
MODEL T3 — Three tanks, immersion. Floor Space 20½ x 66¼. 5,000 pieces or 2,500 dishes per hour. Motor ⅓ h.p. Wash tank capacity 20 gal.; rinse tank capacity total 40 gal.; pump capacity 350 gal. Four 14 x 18 racks.

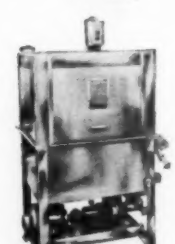


MODEL H—One tank, push through (curtains). Floor space 26 x 28½. Capacity 2,500 pieces or 1,250 dishes per hour. Motor ½ h.p. Wash tank capacity 15 gal.; pump capacity 100 gal. Four 18 x 18 racks.

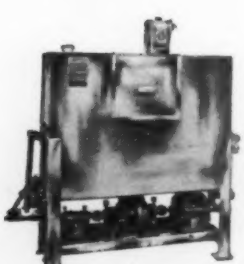
MODEL HD — One tank, straight through (doors). Floor space 26 x 24. 2,500 pieces or 1,250 dishes per hour. Motor ½ h.p. Wash tank capacity 15 gal.; pump capacity 100 gal. Four 18 x 18 racks.

MODEL B—One tank, rack type, push through, roll top. Floor space 20 x 20 with adjustable height. 1250 pieces or 625 dishes per hour. Motor ⅓ h.p. Wash tank capacity 7 gal.; pump capacity 75 gal. Three 16 x 16 racks.

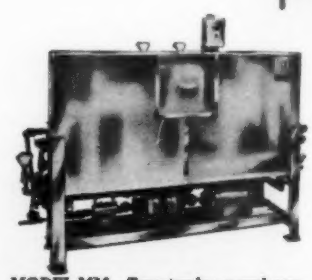




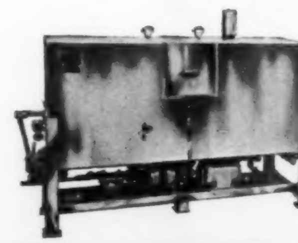
MODEL E — One tank, corner type (doors). Floor space 28½ x 29½. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.



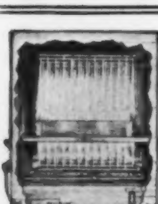
MODEL Y — One tank, pawl conveyor (curtains). Floor space 28 x 46¾. 6,000 pieces or 3,000 dishes per hour. Motor 1 h.p. Wash tank capacity 39 gal.; pump capacity 180 gal. Seven 20 x 20 racks.



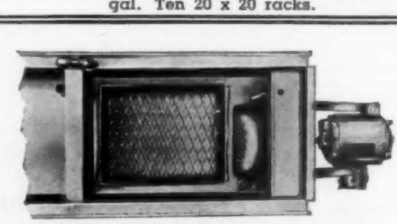
MODEL MM—Two tanks, pawl conveyor (curtains). Floor space 28 x 70½. 10,000 pieces or 5,000 dishes per hour. Motor 2 h.p. Wash tank capacity 27 gal.; rinse tank capacity 27 gal.; pump capacity 360 gal. Ten 20 x 20 racks.



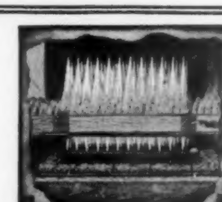
MODEL A — Two tanks, pawl conveyor (curtains). Floor space 28 x 94½. 20,000 pieces or 10,000 dishes per hour. Motor 5 h.p. Wash tank capacity 40 gal.; rinse tank capacity 40 gal.; pump capacity 550 gal. Fifteen 20 x 20 racks.



Interior Arrangement Models "M", "E", and "HD".



Top View of Washing Compartment Models "T2" and "T3".



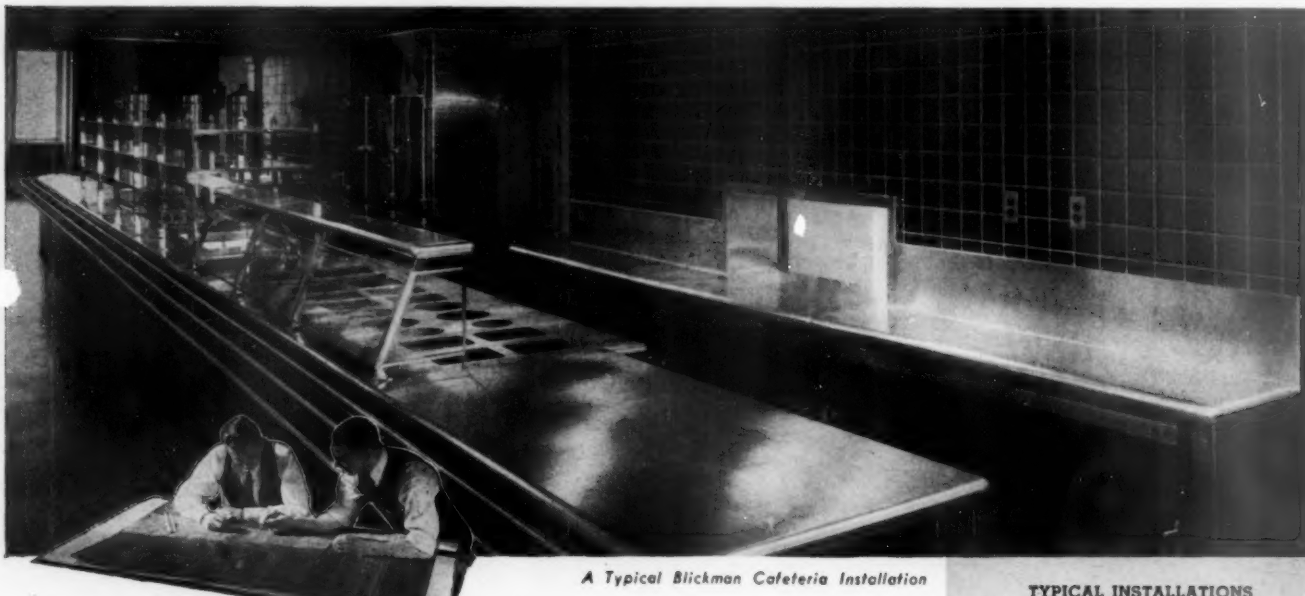
Interior Arrangement Models "U" "H" and "O".

Sold Through Leading Restaurant and Kitchen Equipment Dealers

S. BLICKMAN, INC.

Manufacturers of Food Service Equipment for Schools and Institutions

3400 Gregory Ave.
WEEHAWKEN, N. J.



A Typical Blickman Cafeteria Installation

TYPICAL INSTALLATIONS

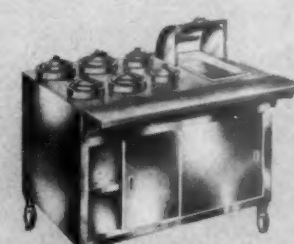
Cornell University, Ithaca, N. Y.
Columbia University, New York
Syracuse University, Syracuse
Hershey (Pa.) Industrial High School
Bayonne (N. J.) Senior High School
Suffern (N. Y.) Grade School
Washington, D. C.—15 schools
U. S. Government: Numerous installations for the armed forces.

A 3-Way Service FOR MASS FEEDING INSTALLATIONS

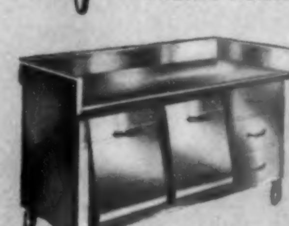
1 ENGINEERING and LAYOUT: Our experts are trained to evaluate the specific requirements of a particular establishment and to arrange space and equipment for most efficient operation. On approved contracts, our service includes related planning, manufacture and installation of complete units — from the small pantry or service counter to the large kitchen serving thousands of individuals.

2 DESIGN and FABRICATION of INDIVIDUAL UNITS: BLICKMAN engineers carefully design each item to carry out its function efficiently. Our units are noted for their welded round-corner construction — providing sanitary, crevice-free surfaces. They are easy to clean, durable and attractive in appearance.

3 THE "KNOW-HOW" IN BUILDING FINE FOOD SERVICE EQUIPMENT: For over 50 years, S. BLICKMAN, INC. has specialized in the planning and manufacture of food service installations for every need. Our factory is one of the largest of its kind. Experienced mechanics work with modern tools to give you the finest in food service equipment.



STEAM TABLES

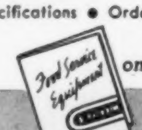


BAKERS' TABLES

INDIVIDUAL ITEMS OF FOOD PREPARATION AND FOOD SERVICE UNITS Include:

Automatic Electric Hot Food Storage Tables
Bain Maries
Cabinets
Cafeteria Counters
Cereal Cookers
Coffee Urns
Cooks Tables
Dish Heaters
Dish Tables
Dish Trucks
Dish Warmers
Food Conveyors
Food Trucks
Kitchen Cabinets
Pan and Pot Racks
Pantry Cabinets and Cupboards
Plate Warmers
Preparation Tables
Range Hoods
Service Units
Sinks
Steam Tables
Storage Bins and Closets
Tray Trucks
Utility Trucks
Urn Stands
Warmers
Water Coolers
Work Tables

Special equipment built to specifications • Orders subject to Government priority regulations

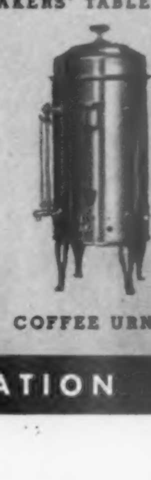


Send for this folder on Food Service Equipment

WORK TABLES

SINKS

DISH TRUCKS



COFFEE URNS

FROM A SINGLE UNIT TO A COMPLETE INSTALLATION

SEDGWICK MACHINE WORKS

Manufacturers of Dumb Waiters and Elevators

Telephone
WAtkins 9-4032

156 West 15th Street, New York 11, N. Y.

Factory
Poughkeepsie, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

General

Sedgwick Dumb Waiters and Elevators are products of specialization since 1893 in school and college installations throughout the country. Numerous types, sizes and capacities are available to meet different requirements and conditions. The main uses are briefly described below.

Food Service

Food supplies, dishes, and other cafeteria, lunch room, dining hall and kitchen loads are quickly and conveniently handled from floor to floor by means of SEDGWICK Electric Dumb Waiters or SEDGWICK Hand Power Dumb Waiters, depending on the individual requirements of service frequency, loads to be handled, and height of travel.

Library Service

Books can be sent without undue effort to the required stack levels or raised from basement storage space as required for distribution by using SEDGWICK Electric Dumb Waiters or SEDGWICK Hand Power Dumb Waiters.

Classroom Service

Books, stationery, crackers-and-milk lunches and general school supplies are systematically sent up or down by SEDGWICK Dumb Waiters without obstructing stairways with the handling of such loads. Electric or manual operation should be determined according to specific duty required.

Dormitory Service

Furniture, trunks, laundry hampers and other bulky and heavy loads are carried from floor to floor by SEDGWICK Hand Power Freight Elevators or SEDGWICK Hand Power Dumb Waiters used as trunk lifts.

Laboratory Service

Supplies and apparatus are safely and easily carried from storage or receiving room to laboratory floors above by SEDGWICK Electric or Hand Power Dumb Waiters conveniently located to save time and effort.

Laundry Service

Laundry hampers and trucks are carried in many laundry buildings on SEDGWICK Electric Dumb Waiters, SEDGWICK Hand Power Dumb Waiters or Freight Elevators.

Infirmary Service

The Sedgwick Hand Power Hospital Elevator provides an economical and unfailing means of carrying patient on stretcher or bed. Meal trays are handled by SEDGWICK Electric or Hand Power Dumb Waiters.

Doors

SEDGWICK Steel Dumb Waiter Doors and Frames are designed to give dependable service in all of the above-mentioned applications. Doors are either bi-parting, single-sliding, or hinged type—and can be built of stainless steel when desired. Approved Underwriters' Labelled construction is followed where called for.

Consultation

Our experience gained from many thouands of installations should be used in planning to best advantage installations of dumb waiters and elevators in school and college buildings. Write or telephone us for recommendations, layouts and specifications which will be gladly submitted at once.

"SEDGWICK Electric Dumb Waiter in Food Service"

HERCULES FOOD SERVICE EQUIPMENT, INC.

1075 Metropolitan Avenue, Brooklyn 6, N. Y.

MANUFACTURERS OF METAL PRODUCTS HERCULES-WARE FOR THE PREPARATION OF FOOD

STOCK POTS

Capacity 2¼-3-5-6-8-10-12 gals. Proportioned and designed to give greatest utility and occupy minimum space in relation to size.

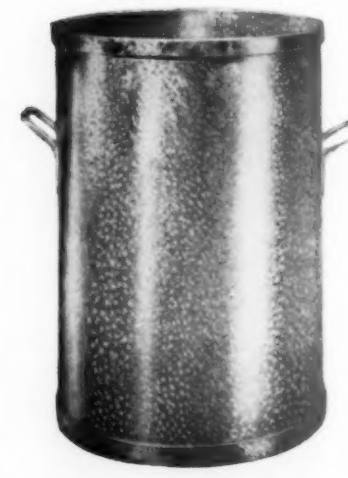
DOUBLE BOILER

Capacity 7½-12-16-21 qts. Large Volume Inset. Water space designed and tested for ample water coverage.

FAMOUS FOR QUALITY, VALUE & DEPENDABILITY

You very likely have heard of Herculesware ... its high quality, value and long efficient service.

We at Hercules are very proud of this reputation, proud of our plant which is one of the most generously tooled in the industry and more than proud of our men whose skills in metal working helped to earn this reputation for us. Next time you are in the market for food equipment or utensils insist on Herculesware ... you will never regret it. Sold only through recognized dealers. *Send for the New Hercules Catalog.*



HEAVY-DUTY GARBAGE CAN

Hot-dip galvanized after fabrication. Leakproof. Completely welded throughout. Reinforced with steel bands on top and bottom ... welded to body. Two ½" dia. welded stationary loop handles. Dia. 17" depth 24" Cap. 24 gals. Also available in black finish.

INSULATED FOOD CARRIER

Body and cover, 20 ga. steel, inner container and bottom of cover, 22 ga. stainless steel. Reinforced top and bottom with 12 ga. band iron. Heavy drop-type handles. Heavy wire carrying loops. Sure-grip locking hasp plus neoprene gasket assures air-tightness. Finished in crackled grey enamel.

High standard of workmanship and finest materials available plus rigid inspection are your assurances of maintained Hercules quality

ALUMINUM WARE

Stock pots • Sauce pans • Mixing bowls • Colanders • Bake pans • Utility pans • Double roasters • Double boilers • Food carriers • Clam and potato steamers • Muffin pans.

GALVANIZED STEEL

Sinks • Drainboards • Garbage cans.

BLACK STEEL

Oyster fry pans • French fry bottoms

STAINLESS STEEL

Sinks • Drainboards • Coffee urns • Utility tables • Sauce pans • Steam table pans • Steam tables • Underbar sinks • Fish boilers • Insulated food and liquid carriers • Clam steamers • Stock pots • Step-on can.

TIN WARE

Muffin pans • Strainers • Stock pots • China caps.

PITTSBURGH PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION

Fifth Avenue at Bellefield Pittsburgh 13, Pa.

DISTRICT OFFICES: CHICAGO · BOSTON · CLEVELAND · NEW YORK
CINCINNATI · ST. LOUIS · MINNEAPOLIS · PHILADELPHIA · CHARLOTTE · SAN FRANCISCO

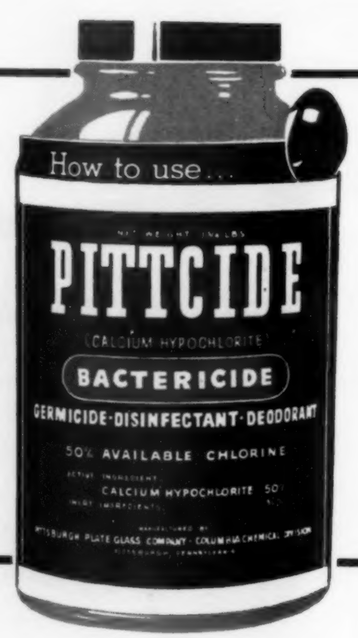
PITTCIDE

AN *EASY-TO-USE*

CHLORINE GERMICIDE

for

EFFECTIVE SANITATION



Pittcide is a specially prepared calcium hypochlorite containing 50% available chlorine. Granular and free-flowing, Pittcide is merely dissolved in water to make chlorine solutions of any strength required. It is excellent for the many germicidal, deodorizing and sanitation uses for which chlorine's effectiveness is universally recognized. Rinse, immersion or flushing applications are used, depending upon requirements.

Packed in 1¾-lb. bottles, 12 per case. Each bottle has complete, easy-to-follow instructions for all uses and a handy measuring spoon for on-the-spot mixing.

Here are examples of the purposes for which Pittcide will provide essential sanitary protection:

GENERAL SANITATION

Pittcide is used to maintain sanitary conditions in school rooms and corridors . . . for sanitizing and deodorizing coat lockers, desks and other facilities . . . and as a germicide in washrooms and toilets.

KITCHENS, RESTAURANTS, CAFETERIAS

The use of Pittcide is highly important for maintaining sanitary conditions throughout food preparation and serving areas. Floors, tables and all types of equipment should be sanitized with Pittcide immediately following regular cleaning. Cooking utensils and tableware should be sanitized before each use. Pittcide makes it easy to follow this practice.

SWIMMING POOLS, LOCKER ROOMS

Pittcide is effective for chlorinating water supplies —and is especially desirable for use in indoor swimming pools, since it eliminates the hazard associated with the handling of liquid chlorine in confined areas, where escaping chlorine gas might endanger the occupants of the building. Pittcide is also fine for maintaining sanitary conditions around the pool, in locker rooms, showers, walkways and on diving boards. It is used for footbaths to retard the spread of "Athlete's Foot."

• FREE INFORMATION ON REQUEST

For free literature containing more complete description, and for prices and the name of your nearest distributor, write The Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pa.

• Note to Distributors of School Supplies — The distribution of Pittcide is available in certain areas. You are invited to write for particulars.

THE JOHN VAN RANGE CO.

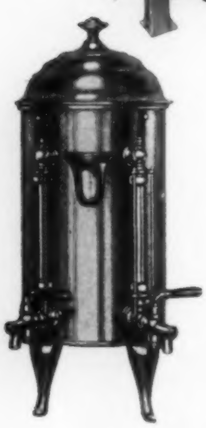
525–555 Culvert Street, Cincinnati, Ohio

A Century of Leadership in

FOOD SERVICE EQUIPMENT FOR SCHOOLS AND COLLEGES

EVER since its establishment in 1847 The John Van Range Company has specialized in designing and manufacturing food service equipment for public and private schools and colleges. The first portable steel range in the world was the invention of the founder of this company. His successors have pioneered in developing new and improved equipment consistent with the advance in the science of mass feeding.

Thousands of establishments for which we have planned the food service departments and manufactured the equipment testify to the resulting economies of maintenance and operation.



COMPARTMENT STEAMERS
STEAM TABLES
FOOD WARMERS
COFFEE URNS
SINKS . . . TABLES
LUNCH ROOM AND CAFETERIA EQUIPMENT

THOSE LISTED BELOW ARE FAIRLY REPRESENTATIVE

Purdue University . . . . . . Lafayette, Ind.
Hanover College . . . . Hanover, Ind.
St. Joseph College . . . . Rensselaer, Ind.
Holmes High School . . . . Covington, Ky.
Ft. Thomas High School Ft. Thomas, Ky.
University of Kentucky . . Lexington, Ky.
Boston Public Schools . . . . Boston, Mass.
Holy Cross College . . . Worcester, Mass.
North Carolina State College Raleigh, N. C.
University of Cincinnati Cincinnati, Ohio
Hebrew Union College Cincinnati, Ohio
Withrow High School . . Cincinnati, Ohio
Woodward High School Cincinnati, Ohio
Xavier University . . . . . Cincinnati, Ohio
Ohio State University . . Columbus, Ohio
Hiram College . . . . Hiram, Ohio
Miami University . . . . Oxford, Ohio
Providence College . . . Providence, R. I.
University of South Carolina Columbia, S. C.
University of Tennessee Knoxville, Tenn.
University of West Virginia Morgantown, W. Va.
Marshall College . . Huntington, W. Va.

Send Us Your Inquiries

The John Van Range Co.
DIVISION OF THE EDWARDS MANUFACTURING CO.
Cincinnati

BRANCHES IN PRINCIPAL CITIES

THE INTERNATIONAL SILVER COMPANY

Hotel Division · Meriden, Conn.

QUALITY SILVERWARE for

HOTELS • RESTAURANTS • HOSPITALS • TEA ROOMS • CLUBS

A Quality for every need . . .

INTERNATIONAL SILVER COMPANY

EXTRA HEAVY HOTEL PLATE

This is the very finest hotel silverplate we can make, in design, weight, thickness of plate and finish. It is the silverplate chosen by many of America's foremost hotels.

CROMWELL SUSSEX

INTERNATIONAL S. CO. XII TRIPLE

Better restaurants everywhere pick this fine silverplate. It is quality throughout—giving you finer finish, finer appearance and longer use thanks to many unusual construction features.

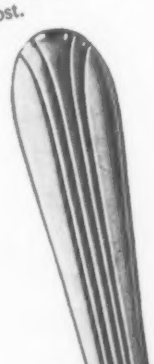
COPLEY AMERICAN

Shown here are only a few of the many designs available in these quality lines.

SILCO STAINLESS FLATWARE

EMPIRE PATTERN

this is the very finest quality heavy weight stainless steel flatware . . . especially designed for fountains, schools and institutions. Its many labor and money saving features will more than repay you its slightly higher initial cost.



SILCO STAINLESS FLATWARE

REPUBLIC PATTERN

the ideal low cost medium weight flatware for fountains, bars, diners . . . any place where washing and maintenance facilities are limited. Many unusual features.

VICTOR S. CO. I S

The outstanding silverplate value for busy restaurants. This fine silverplate combines quality with low cost in eight quality features.

SAVOY MODERN

I S
HOTEL DIVISION
THE
INTERNATIONAL
SILVER COMPANY
MERIDEN, CONNECTICUT

Your food service equipment or supply dealer is ready to help you meet all your tableware requirements. Just call him.

ASSOCIATED PRODUCTS, INC.

1025 Second National Building
Akron, Ohio

Akron Electric Equipment Gives Schools—Universities Greater Cooking Efficiency with Minimum Labor!

WHETHER you feed a hundred or a thousand persons at a time, your school demands the greatest possible kitchen efficiency with minimum labor, with savings in fuel costs, maintenance, clean-up time, food shrinkage, flavor, color and precious food elements often lost through quantity cooking methods.

Modern cooking is electric cooking. Akron Electric Cooking Equipment is designed for school kitchens with long lived dependability, quality built into every part. Akron Equipment is compact—stays clean, cool. Its accurate, automatic temperature controls constantly guard cooking costs against waste, burning or drying out of foods.

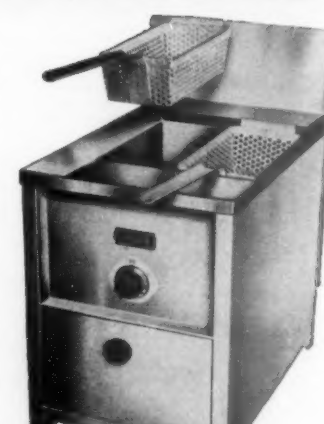
Akron builds equipment for every institution cooking need. Write today for the helpful Akron Selection Chart, an accurate guide in choosing the right cooking equipment for your specific need.

AKRON 621 RANGE

More versatile than ever, the 621 range offers your choice of 13 cook-top combinations for every mass cooking requirement. Sturdily built, completely serviced from the front, beautifully finished for long life and economy of operation. Its accurate cooking brings out foods natural flavors while retaining food values to the utmost.

AKRON 360 GRIDDLE

A large general utility griddle for wide use in all size institutions. Grease troughs on sides, front and back drain to the removable grease box on front. Insulation below griddle conserves heat. Griddle hinges at back so that it may be tilted for easy inspection or adjustment if needed.



AKRON 912 FRYER

Made of smooth, gleaming Monel Metal for long service, beauty and ease in cleaning. The cover becomes a splash back (as shown), an exclusive Akron feature. When not in use, the cover slides over the pit protecting the contents from dust and vermin and conserves heat during idling. Easily drained at bottom in one operation—no dipping or dripping. Automatically controls temperature at desired degrees.

AKRON 612-02 OVEN

Akron Ovens are available in 3 sizes. Single, double and triple. Each oven is 23" wide by 29" deep by 13" high in the clear. Heavy oven rack of flat strip steel and angle iron. Three rack positions. Nonburn rack for lower deck. Insulation 2½" to 3" all sides, door 2". Beautifully finished with black baked enamel. Economical to use—built for long dependable service.

ASSOCIATED PRODUCTS, INC.

Akron

1025 Second National Bldg. • AKRON, OHIO

THE FORMICA INSULATION CO.

4533 Spring Grove Avenue, Cincinnati 32, Ohio

Do You Know...

What 129,700 designer and decorator, readers know about Beauty Bonded Formica for Office Furniture?

In beautiful full color, this Formica furniture story is being told in current issues of design magazines.* You'll want the latest information on why Formica is fast becoming a basic material for furniture in office, home, and institution.

Write for color reprints of this advertisement, together with pictorial story of Beauty Bonded Formica, at Home with People
Formica, 4533 Spring Grove Avenue, Cincinnati 32, Ohio.

Beauty Bonded
FORMICA
Reg. U. S. Pat. Off.
Guaranteed by Good Housekeeping
at Home with People
at Work in Industry

* ARCHITECTURAL FORUM
ARCHITECTURAL RECORD
PROGRESSIVE ARCHITECTURE
ARTS AND ARCHITECTURE
INTERIORS

CARROM INDUSTRIES, INC.

Designers and Manufacturers of Wood Furniture for Institutional Service

NEW YORK OFFICE
Ralph H. Berg
Room 413
19 West 44th Street
New York City

Ludington, Michigan

CHICAGO OFFICE
James L. Angle
1503 North Sedgwick Street
Chicago, Ill.

No. 1808 EASY CHAIR. Seat size 21" x 23", back height 35", spring seat and back unit. Slip covers easily removable. Northern Hard Birch. Stretchers and top back rail pinned to posts. Metal glides. Crated weight, 80 lbs.

ALL CARROM wood furniture is especially designed and constructed for institutional service—to resist abuse, yet combine beauty with long life. And it is built exclusively of Northern Hard Birch . . . because this wood is exceptionally tough and strong and has a fine, regular grain that takes a beautiful finish. Only a specially selected quality is used in Carrcm Furniture.

From a construction standpoint, Carrom Furniture is built to give long, economical service. All posts, for example, are one piece, made from extra heavy stock, and joints are glued and pinned together for extra strength.

Whether you need a single piece or furniture for an entire building, we invite your inquiries because we know Carrom Furniture will give complete satisfaction.

No. 4002-4053 CHEST WITH ATTACHED MIRROR. Top 18⅝" x 34", height 42½". Mirror plate 16" x 20". Metal glides. Northern Hard Birch frame construction. Top drawer fronts, end panel rotary, select Northern Birch plywood. Crated weight, 180 lbs.

The items described and illustrated on this page are typical examples of Carrom Wood Furniture, embracing a complete and varied assortment to meet your requirements. Write to our nearest office for detailed data regarding furniture in which you may be interested.

No. 4007 SIDE CHAIR. Seat 17" x 17", back height 34". Solid Northern Hard Birch throughout. Solid hardwood saddle seat. Top back rail and stretchers pinned to posts. Metal glides. Crated weight, 20 lbs.

No. 4001 DORMITORY BED. Width 36". Height of foot end 20¾", head end 30½". Equipped with sliding shoes. Posts and rails of solid Northern Hard Birch. Plywood panels of rotary cut, select, white Northern Hard Birch. Rails and panels pinned to posts. This eliminates loose joints. Crated shipping weight of bed ends, 60 lbs. **Can be equipped with one piece fabric or coil spring or metal rails to support separate spring.**

No. 4013 SINGLE BOOK END DESK. Solid Northern Hard Birch posts and rails. Northern Hard Birch plywood top, drawer front, center panel and shelves. Top 20" X 36", height 30". Full box drawer construction, center drawer guided. Slides easily. Metal glides. Crated weight, 100 lbs.

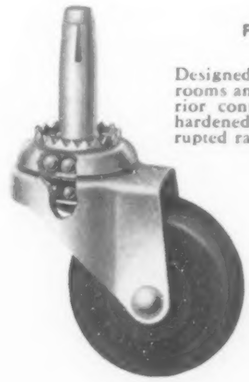
CARROM

WOOD FURNITURE FOR DORMITORY SERVICE

FAULTLESS CASTER CORPORATION

DEPT. SU-48
Evansville, Indiana

REPRESENTATIVES IN PRINCIPAL CITIES — CANADIAN FACTORY: STRATFORD, ONTARIO



FAULTLESS DOUBLE BALL BEARING CHAIR CASTERS

Designed especially for use on chairs in offices, study rooms and libraries, where quiet is essential. Of superior construction, this caster has two full rows of hardened ball bearings swiveling freely in uninterrupted raceways. Low over-all height, dust-proof construction. Bearings lubricated at factory. Furnished with either Ruberex (cushion tread) or Plaskite (hard tread) wheel. A very easy swiveling caster.

Copper Oxidized Finish

Style No.	Kind of Wheel	Diam. of Wheel	Wt. Per Set of 4
2478	Ruberex	1⅝"	1 Lb. 6 Oz.
2479	Ruberex	2"	1 Lb. 10 Oz.
2378	Plaskite	1⅝"	1 Lb. 4 Oz.
2379	Plaskite	2"	1 Lb. 10 Oz.

Packed one set in a box.

Faultless Light Duty Truck Caster has two complete ball races, using best grade balls, all bearing surfaces hardened, special king pin construction, dust-proof. Furnished with Roller Bearing Ruberex or Plaskite wheels. A very strong, durable caster.

Style No.	Kind of Wheel	Diam. Wheel	Size Plate	Lbs. Cap. Each
1123-3	Ruberex	3"	4 x 4	200
1123-4	Ruberex	4"	4 x 4	250
1131-3	Plaskite	3"	4 x 4	300
1131-4	Plaskite	4"	4 x 4	350

Rubber Tired Wheels available

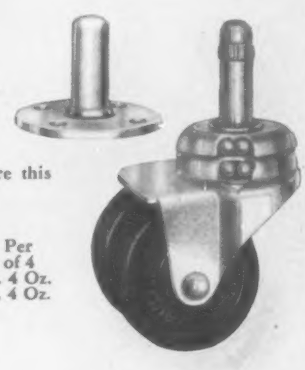
FAULTLESS DOUBLE WHEEL PIANO CASTER

This double wheel, double ball bearing, noiseless Piano Caster has two rows of ball bearings operating in lubricated hardened raceways. Used with No. 98 socket. Wood Ferrule for use over socket for large drilled hole. Supplied with a plate, where this type is needed.

Copper Oxidized Finish

Style No.	Diam. of Wheel	Kind of Wheel	Wt. Per Set of 4
BW479-2	2"	Ruberex	2 Lbs. 4 Oz.
BW379-2	2"	Plaskite	2 Lbs. 4 Oz.

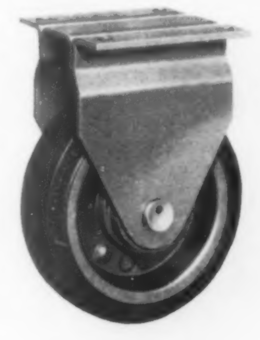
Size Bore 5/16" x 1½".
Packed one set in a box.



This Faultless Rigid Truck Caster is a desirable companion to the 1100-Series. Made of extra heavy gauge steel. The 1700-Series Rigid and 1100-Series Swivel Casters have the same mounting hole positions and same over-all height, for interchangeability and quick replacement.

Style No.	Kind of Wheel	Diam. Wheel	Size Plate	Lbs. Cap. Each
1723-3	Ruberex	3"	3 11/16 x 3 11/16	200
1723-4	Ruberex	4"	3 11/16 x 3 11/16	250
1731-3	Plaskite	3"	3 11/16 x 3 11/16	300
1731-4	Plaskite	4"	3 11/16 x 3 11/16	350

Rubber Tired Wheels available

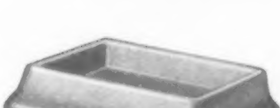


FAULTLESS DESK CUPS

Faultless Ruberex or Rockite Desk Cups are of nonbreakable, rust-proof composition, in a harmonizing brown shade.

Round Shape Desk Cups

Style No.		Wt. Per Set of 4
RDC	1 3/16"	5 Oz.
RDC	1⅝"	7 Oz.



Square Shape Desk Cups

Style No.		Wt. Per Set of 4
SDC	1½"	6 Oz.
SDC	1¾"	7 Oz.
SDC	2"	13 Oz.
SDC	2⅝"	15 Oz.

Packed one set in a box.

This Faultless Ball Bearing Swivel Caster is a companion caster to the 700-Series Caster. Furnished with Ruberex (cushion tread) Roller Bearing wheel.

Style No.	Diam. Wheel	Size Plate	Lbs. Cap. Each
323-5	5"	4" x 7"	350
323-8	8"	4" x 7"	400

FAULTLESS CUSHION CHAIR GLIDES

Faultless quiet Cushion Chair Glides are mounted in live rubber. Steel reinforcing frame prevents nail pulling out. Base is of hardened steel, copper oxidized, impervious to wear. Furnished with Spring Clip Socket for square or round tubing, ⅞", 1" and 1 1/16". Approx. wt. per box, 5 oz.

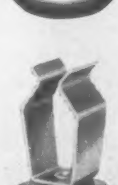
Flexible Cushion Chair Glide

Style No.	Diameter of Base
NRS	⅞"
NRS	1 1/16"
NRS	1¼"
NRS	1½"

Cushion Chair Glide Spring Clip Socket

Style No.	Diameter of Base
ORS	⅞"
ORS	1 1/16"

Packed one set in a box.



This Faultless Rigid Plate Caster is a companion caster to the 300-Series Faultless Swivel Plate Caster. The heights are identical with the 300-Series. It has a full drawn, formed, heavy gauge, steel horn. Furnished with Ruberex, Roller Bearing wheel.

Style No.	Diam. Wheel	Size Plate	Lbs. Cap. Each
723-5	5"	4" x 4¾"	350
723-8	8"	5 1/16" x 6 1/16"	400

SIMMONS COMPANY

Chicago 54, Merchandise Mart
San Francisco 11, 295 Bay Street

New York 16, One Park Avenue
Atlanta 1, 353 Jones Avenue, N.W.

SIMMONS DORMITORY FURNITURE...

STUDENT'S ROOM BY SIMMONS

...for years of hard service!

Even twenty years of continuous service is not unusual for Simmons dormitory furniture. It is built of *fireproof* steel to withstand the hardest usage. Tops and sides of chests and desks are of one-piece construction. All supports and braces are electrically welded. Drawers never warp or stick, but operate smoothly and quietly on wood drawer guides. Rubber-cushioned spring clip safety stops prevent drawers from falling out when opened.

Simmons *all-steel* dormitory furniture is finished in cheerful, warm colors that stay attractive. You have your choice of rich grained, or two-toned pastel combinations. These *Simfast* finishes successfully resist heat and sunlight, and the actions of most liquids, hot or cold. Nor will they chip, mar, peel or crack!

Your nearest Simmons distributor will be glad to help you make the right selection of pieces to meet your requirements. See him soon, or write

CONTRACT DIVISION
Display Rooms:
Chicago 54, Merchandise Mart · New York 16, One Park Avenue
San Francisco 11, 295 Bay Street · Atlanta 1, 353 Jones Ave., N. W.

Illustrated above:
Dormitory Room No. 142

Bed	H-348-SKC
Chest	F-142-4
Mirror	FM-42
Desk	F-142-12
Night Tables	F-142-14
Arm Chair	F-762
Chair	F-711

Color Scheme . Brown and Beige
Scheme No. 7161

ALL-STEEL . . . FIRE-SAFE . . . COLORFUL!

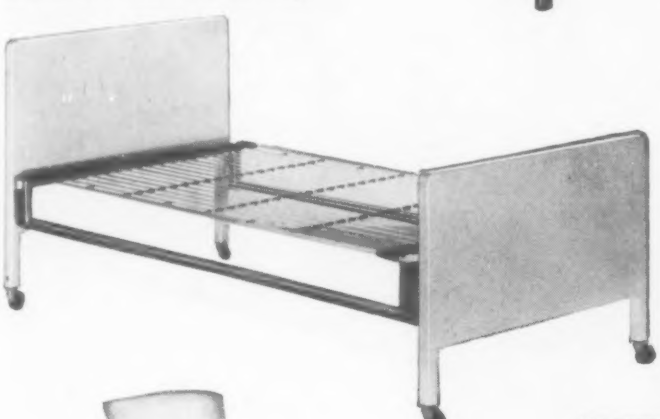
SIMMONS No. 142 FURNITURE GROUP

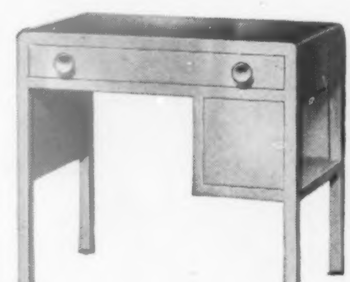
School authorities like the variety of pieces available in the 142 Group. It enables them to equip rooms of any size or shape comfortably and efficiently. They also like the 142 Group for its moderate initial cost, slow depreciation and low maintenance expense. Shown below are a few of the pieces in the 142 Group, together with chairs most frequently selected for dormitory rooms.

Desk—F-142-6—Modern table type. Full drawer. Distinctive metal pulls. Available in grain and two-tone finishes. All steel. Top area 34½ x 19 inches.

Dresser—F-142-2—Medium-sized dresser. Three drawers. Top drawer has center partition. Available in three other sizes (30½ x 19 inches and 44 x 19 inches). In grain and two-tone finishes. Top area 38½x19 inches.

Bed—H-353—Attractive full panel ends. Three-piece construction. SKC ribbon fabric spring. Available in 3/0 or 3/3 width only.





Desk—F-142-10—Student's single model. Open book shelf at right end. All-steel. In grain and two-tone finishes. Top area 34½ x 21 inches.

Chair—F-711—Comfortable modern style. Posture seat and back cushioned in foam rubber. Upholstered in simulated leather in colors.

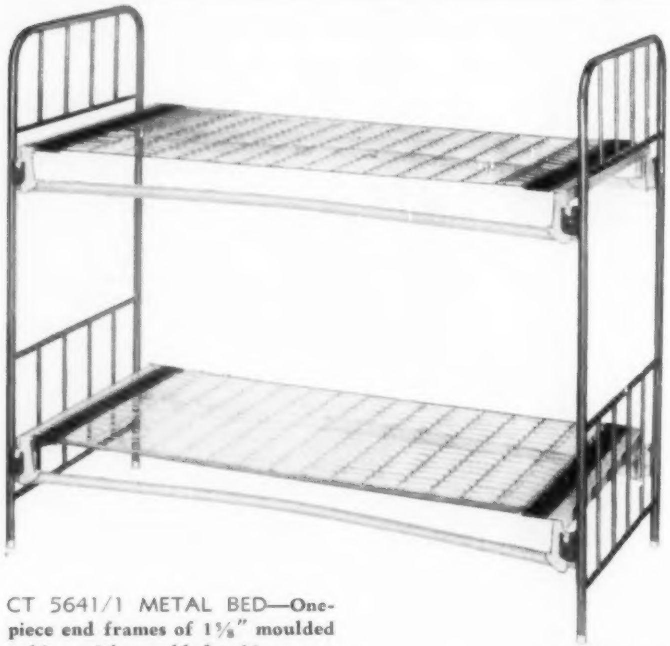
Chair—F-762—Gracefully curved arms. Innerspring seat and back cushions; both removable. Back cushion is reversible. Upholstered in simulated leather in colors.

Beautyrest MATTRESSES!

Built expressly for schools, hotels and institutions! Beautyrests are famous for comfort and for the years of trouble-free service they give. That's why more schools, colleges, universities, hotels and institutions are buying Beautyrests . . . many of them exclusively! Ask your Simmons dealer to show you the many features that make Beautyrest your best mattress buy!

SUPERIOR SLEEPRITE CORPORATION

Contract Department, 2219 South Halsted Street, Chicago 8, Ill.



CT 1[illegible]

CT 1682 BUNK BED—**Utmost strength and rigidity are achieved by ends of continuous 1.9" steel tubing, locked to riser link springs with heavy side rails of cambered oval tubing. 1 inch cross rods; ½-inch fillers. The Link spring is helical suspended, has band steel border. Overall height, 62⅝"; top spring height, 49¾"; bottom spring height, 16¾". Solid color or wood grain finish. Size 3/0.**

CT 5641/1 METAL BED—**One-piece end frames of 1⅝" moulded tubing with moulded tubing cross rods and fillers. Height of ends, 26". Fabric height, 18". Link fabric spring with helical end suspension, cambered oval tube side rails.**

All Metal Products Available in Finishes to Match Sleeprite Case Pieces

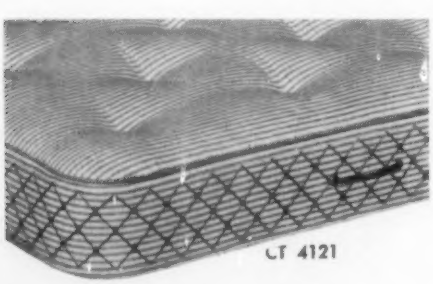
CT 5641/1

CT 4658/1

CT 4658/1 METAL BED—**Semi-Windsor outline of moulded tubing with substantial, shaped vertical fillers. Harmonizes well with most conservative styles of furnishings. Height of ends, 26". Fabric height, 17". 2-inch casters. Size 3/0.**

CT 4121 INNERSPRING MATTRESS—**Full inner-roll construction; 231 coils (4/6). Sisal pad insulation, white layer-cotton-felt upholstery. Pre-built border. 8 oz. woven stripe ticking. Widths: 54", 39" and 36".**

CT 4303 CHAIR — **Attractively proportioned of square steel tubing with flat tube fillers. Neatly upholstered seat. Height, 35". Seat height, 18¼". Seat, 16 x 15 in.**



CT 4121

CT 4122 INNERSPRING MATTRESS—**Full inner-roll construction; 231 coils (4/6). White layer-cotton-felt upholstery insulated with Flex-O-Lator element and stitched curled hair pad. Embroidered, pre-built border. 8-oz. woven stripe cover. 54" and 39" widths.**

CT 4122

TO LIVE RIGHT... *Sleeprite*

SUPERIOR SLEEPRITE CORPORATION

Contract Department, 2219 South Halsted Street, Chicago 8, Ill.

CT 1650 DRESSER

Height overall	66 in.
Height of base	33 in.
Width	38 in.
Depth	19 in.
Mirror	28 x 30 in.

SUPERIOR SLEEPRITE METAL FURNITURE

Prime sheet steel, careful welds ground smooth, and liberal internal reinforcement are standard Superior features. Sound insula ion and cushioned drawer stops assure quiet. Metal combines fire resistance and surface permanence with economical installations.

Choice of Vitarite Finishes

Synthetic baked-on enamel of permanent quality. All Sleeprite metal furnishings are available in any VITARITE genuine wood grain or solid color finish.

CT 1650 CHEST

Height	44 in.
Width	31 in.
Depth	19 in.

CT 1650 CHEST

CT 4728

CT 4727

CT 1860 DRESSER

SUPERIOR SLEEPRITE METAL DESKS

Built to same high standards as Sleeprite case goods. In double version, center drawers open from both sides. 1¾ in. square tube posts.

CT 4727 DOUBLE STUDY DESK

Height	31 in.
Width	48 in.
Depth	30 in.
Shelves	9½" high, 9¼" deep

CT 4728 DESK

Height	31 in.
Width	36 in.
Depth	25 in.

CT 1860 DRESSER

Height overall	69½ in.
Height of base	36 in.
Width	41 in.
Depth	19 in.
Mirror	30 x 32 in.

CT 1860 DESK

CT 1860 DESK

Height	30 in.
Width	31 in.
Depth	19 in.

TO LIVE RIGHT... *Sleeprite*

BAVINCO MANUFACTURING CORPORATION

2745 Seneca Street
BUFFALO 10, N. Y.

Bavinco

EQUIPMENT DESIGNED SOLELY FOR HOMEMAKING DEPARTMENTS

The Bavinco Manufacturing Corporation's new book of Homemaking Equipment is far more than a catalog. It contains illustrations of typical rooms, suggested room layouts and a review of Bavinco's complete line of Homemaking Equipment. It presents a studied collection of tested ideas prepared especially for those interested in remodeling or equipping a Homemaking Department.

The following pages contain a few popular selections from this book. You will note in all illustrations the desire for perfection in duplicating home atmosphere in the classrooms of today.

Whether remodeling a present department, or planning a new one, Bavinco Planning Service is available. See Page 26 for details of this service.

ASK FOR YOUR COPY OF THIS NEW BOOK

William J. J. Chase, Architect

Bavinco

FOODS ROOM

Equipment

Bavinco was first to introduce the home unit kitchen, now accepted as the pattern for the ideal Foods Room. Along with this idea, Bavinco brought forth a new line of home-like equipment with special emphasis on lasting construction. Gay color combinations, combined with modern time and step saving features, have given Bavinco Foods Rooms unqualified acceptance from coast to coast.

PULL OUT TABLE AND BAKING UNIT CABINET

Cat. No. 36PT:—The full width solid maple pull out table, exclusive with Bavinco, provides a lower work level. Counter top 36″ high, pull out table 28″ high as illustrated, or 32½″ high when interchanged, at factory, with top drawers. Makes an ideal place for food preparation. May also be used as a service table or desk and solves the problem of where to attach the meat grinder.

ROTARY CORNER BASE CABINET

Cat. No. 34RO:—Solves the difficult corner storage problem, while at same time allows two students to work at adjoining counters without interference. The large revolving shelf has handy compartment arrangement.

Cat. No. 24C:—Corner Wall Cabinet designed to fit over rotary base cabinet and join with wall cabinets (not illustrated).

REFECTORY TYPE KITCHEN TABLE

Cat. No. 3840:—Designed for food preparation, service and classwork. Acid resisting top and leaves of colored plastic or white porcelain.

Ask for BAVINCO'S Book of Homemaking Equipment

Bavinco

CLOTHING ROOM

Equipment

To eliminate the storage problem for each pupil's sewing supplies, Bavinco perfected a system of individual trays interchangeable from sewing case compartments to table compartments. Built around this accepted time-saving feature is a perfectly matched line of storage cases for every need, sewing tables and all necessary sewing room accessories, such as, mirrors, fitting stands, etc. A few of the most popular items are shown below.

Cat. No. 9F:—GENERAL STORAGE AND FILING CASE—50" wide x 81" high x 24" deep. Contains one full width shelf, five trays, three file drawers and one utility drawer.

Cat. No. 2FW:—INTERCHANGEABLE TRAY CASE—Height 81" x 24" deep available in 3 widths—24" wide (28 trays) 38" wide (42 trays) 48" wide (56 trays). Trays designed to fit 200 series sewing tables.

SEWING TABLES—Bavinco Sewing tables are available in a variety of sizes and types. The most popular are the 200 series tables, designed for interchangeable trays from 2FW cases.

ALL-PURPOSE ROOM

The All-Purpose Room meets the general requirements for all around class instruction where small family groups are simultaneously engaged in diversified work. The choice of proper equipment to effectively support such an integrated program becomes doubly important. Bavinco Foods and Clothing Room equipment has been especially designed to permit the rapid change-over from one activity to another. This flexibility of use together with its ease of re-arrangement has made Bavinco the popular choice of schools and universities who plan for today and for the future.

Ask about BAVINCO'S Free Planning Service

Bavinco PLANNING SERVICE

Bavinco planning service has been set up to help schools and universities work out the most satisfactory solution to their individual equipment needs. Where sketches giving details of room characteristics are provided, Bavinco will furnish complete drawings showing recommended equipment and location. As past experience has shown that some time is usually required to prepare drawings and submit them, and go through the necessary steps in placing school orders it is important to remember that planning should start well in advance of the desired installation date. Bavinco Planning Service is available to all schools and colleges without cost. Just send a rough pencil sketch with the following information:

1 Size of room or rooms.

2 Location and size of each door and window including casing. (Please mention if any door or window can be moved or eliminated.)

3 Distance from floor to bottom of window sills.

Indicate location and sizes of:

4 Radiators or hot or cold air ventilators.

5 Pipes

6 Pillars

7 Hot and cold water and gas lines.

Indicate any other obstructions which might interfere with placing of cabinets or cupboards.

List this information with your sketch:

8 If numbers 4, 5, 6, or 7 on your sketch can be relocated or eliminated, please indicate. If there are any partitions in the room state whether or not they can be removed.

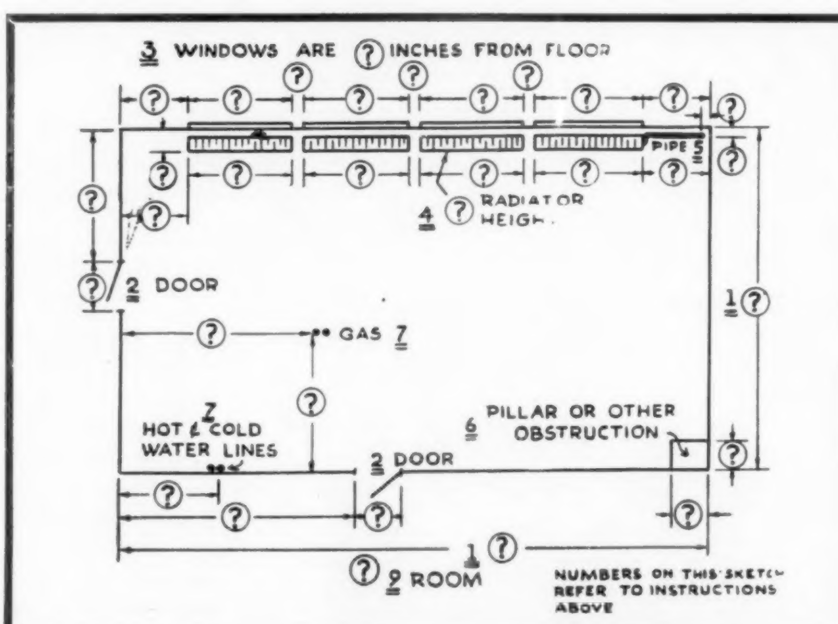
9 Purpose of room: foods, sewing, all-purpose, etc.

10 Number of students in each class, also total number in clothing classes.

11 Number of teachers in the department.

12 State whether planning for a new building or for a new department in an old building.

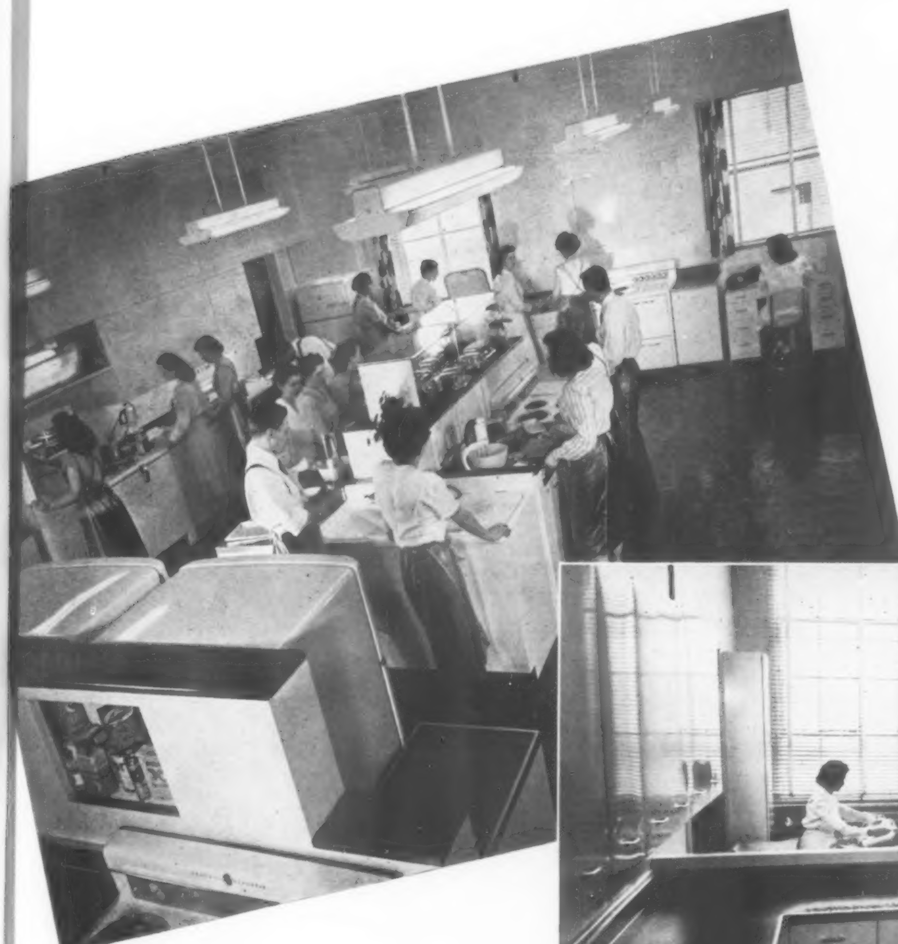
Below is shown a typical sketch giving the information needed. Furnishing full details will save time and correspondence. Send us your sketch.



EXAMPLE

Window sills are 46" from floor. Ceiling height 11'8". Radiators A & B can be moved. Room is to be an All-Purpose room. Provide for 20 Students for foods and 20 for sewing. Total in sewing classes 120. Two teachers. We are planning to remodel a department in an old building.

GENERAL ELECTRIC EQUIPS THE MODERN HOMEMAKING DEPARTMENT



In the training laboratories of the General Electric Consumers Institute, trainees receive instruction in the use of modern all-electric kitchen and laundry equipment.

The Consumers Institute staff of experts use electric appliances just as they are used in the home and in the classroom. They pass along new and improved laundry methods — new methods of food preparation and preservation.

GENERAL ELECTRIC COMPANY

APPLIANCE AND MERCHANDISE DEPARTMENT

BRIDGEPORT 2, CONNECTICUT

EFFECTIVE PLANNING OF THE

Most educators agree that for practical training in general home economics classes, home-type equipment is the most desirable. Students should work with modern appliances, just as they will use them in the homes they establish in the future. Equipment should be arranged according to the most modern, stepsaving, work-center idea of good kitchen planning. Furthermore, both arrangement and equipment should be changed as often as necessary, to keep pace with progressive teaching.

The photographs shown, taken at the Langley High School in Pittsburgh, Pennsylvania, with the co-operation of Earl A. Dimmick, Superintendent of Schools, and Irene E. McDermott, Director of Home Economics Education, testify to the success of this ideal. In this effectively arranged, well-designed home economics kitchen and laundry, students learn through actual practice the art of modern homemaking.

General Electric Company and its Home Bureau have set the pace for these modern homemaking classrooms. As in the case of the highly successful Langley "Homemakers of Tomorrow" project, General Electric distributors and retailers work continually with educators in providing the most up-to-date equipment available — the most convenient arrangement possible. Their planning offers actual home conditions, readapted for effective teaching.

On the following pages, General Electric's special sales plans are outlined for educational institutions. Also given are descriptions of some of its many products that will be useful in successful training of the homemakers of tomorrow.

At Langley High, both girls and boys learn how to store food correctly in a General Electric refrigerator.

Langley students are taught how to prepare, package, and freeze all sorts of food in the General Electric home freezer.

CLASSROOM KITCHEN AND LAUNDRY

▲
In this attractive General-Electric kitchen, Langley students learn that the kitchen can be the center of informal training as well as the hub of family life.

▲
This modern G-E automatic electric sink, with dishwasher and Disposall* unit, takes the drudgery out of clean-up time for Langley home economics students.

►
Student demonstration is encouraged at Langley High because, among other things, it helps to give the pupil self-confidence.

**General Electric's registered trade-mark for its food-waste disposal appliance.*

FINE HOMEMAKING CLASSROOMS

NF-10 REFRIGERATOR

General Electric Space Maker Refrigerators provide up to one-third more refrigerated storage space in almost exactly the same floor space as that occupied by previous eight-cubic-foot models. The de luxe ten-cubic-foot Space Maker illustrated (Model NF-10) has many special timesaving, laborsaving convenience features which have been tested for practical utility in the General Electric Consumers Institute kitchen. G-E Refrigerators are cooled by the famous General Electric sealed-in refrigerated system, which gives dependability and low operating costs. G-E refrigerators are available in a variety of sizes and models to meet the needs of all home economics kitchens.

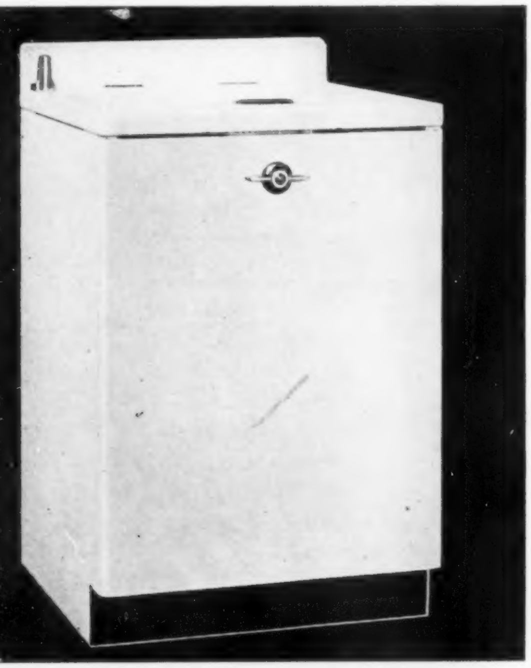
NA-18 HOME FREEZER

General Electric Home Freezers have a temperature range of from 10 F to 0 F, and are cooled by the same type of sealed-in refrigerating system as that used in G-E Refrigerators. G-E Home Freezers are available in two sizes . . . the eight-cubic-foot model illustrated (Model NA-8), which holds as much as 280 pounds of frozen food, and a four-cubic-foot model (NA-4) which holds as much as 140 pounds. Both models have a counterbalanced lid, an automatic interior light, and are equipped with wire storage baskets for easy accessibility and segregation of foods.

NH-8 COMBINATION REFRIGERATOR

The General Electric Refrigerator-Home Freezer Combination offers all the advantages of a Space Maker Refrigerator *and* a Home Freezer, both in one cabinet! The upper, or freezer, compartment is separately refrigerated and separately insulated. It holds up to 53 pounds of frozen food, and will maintain zero degree F, so it can be used like a home freezer. The separate door prevents "cold waste" in the freezer when the fresh-food compartment door is opened. The lower, or fresh-food compartment holds as much food as the average eight-cubic-foot model. Because of the high relative humidity, it is not necessary to cover foods . . . and it is *never* necessary to defrost the fresh-food compartment!

ELECTRICAL EFFICIENCY FOR



G-E AUTOMATIC DISHWASHER

The Automatic Dishwasher takes up to 100 pieces. It washes and twice rinses dishes—uses water hotter than the hands can stand. When dishes are washed and rinsed, the machine turns off automatically, and the cover rises to allow dishes to dry.

THE GENERAL ELECTRIC AUTOMATIC ELECTRIC SINK

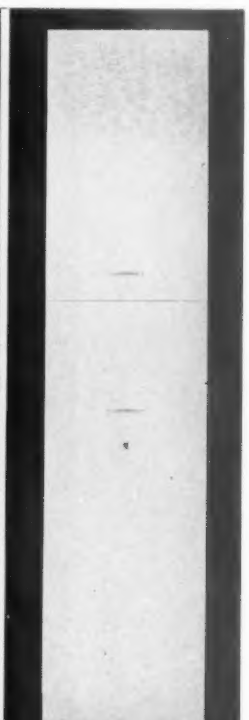
Includes the Automatic Dishwasher and the remarkable General Electric Disposall in a single, attractive unit. The Dishwasher washes and twice rinses dishes, cutlery, pots and pans in a few minutes. Then the machine automatically stops, and the cover rises to allow the dishes to dry. The Disposall shreds and flushes all fresh food waste down the drain.

THE GENERAL ELECTRIC DISPOSALL

The Disposall is installed in the sink drain. It shreds and pulps the food waste into tiny particles and flushes them down the drain.

GENERAL ELECTRIC STORAGE CABINET

These cabinets are precision-built of heavy-gage sheet steel with welded construction for strength and rigidity. Easily installed. Attractive in appearance and most convenient in use. Cabinets can be wired for automatic interior lighting.



MODERN HOMEMAKING CLASSES

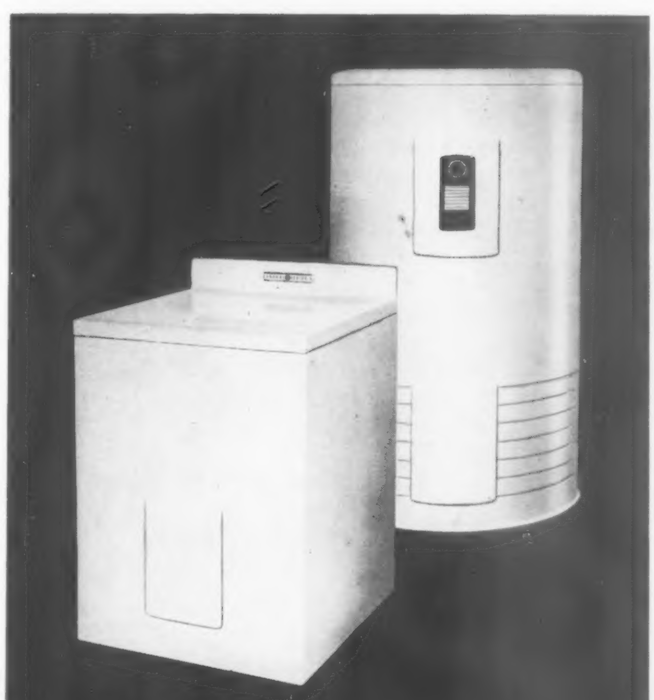
G-E AUTOMATIC ELECTRIC RANGE

Featuring a new, exclusive General Electric innovation — push-button control. . . . just a slight finger pressure gives instant, even heat from the famous G-E Calrod unit. Tel-A-Cook lights say "what's cooking" . . . The famous Tripl-Oven, Master Oven, Super Broiler, Speed Oven . . . Automatic Oven Minder for automatic oven control . . . Built-in pressure cooker.

G-E AUTOMATIC ELECTRIC WATER HEATERS

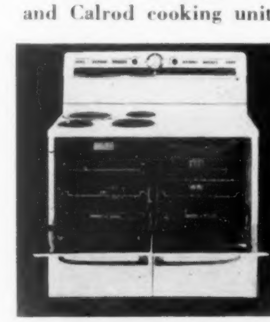
The General Electric Automatic Electric Water Heater provides clean, hot water with a minimum of care. The famous G-E Calrod* heat-wrap unit gives hot water at a constant temperature. It's safe, too, . . . no flames, no fumes, no smoke . . . It can be installed anywhere. Available in both round and table top models.

*Trade-mark Reg. U.S. Pat. Off.



G-E STUDIO MODEL

If space is limited, here's the answer for increased cooking capacity in small classrooms. The Studio has many of the features found on standard-sized ranges, including the large oven and Calrod cooking units.



ED1-F LIBERATOR RANGE

Extra Capacity . . . in the new G-E Liberator Range featuring two ovens . . . Master Oven and Companion Oven . . . both fully equipped for baking, roasting, and broiling.

HANDY, SMALL APPLIANCES

THE G-E PORTABLE MIXER zips through troublesome meal-preparing tasks in a jiffy. Exclusive three-beater construction for thorough and uniform mixing. Built-in light illuminates bowls. Complete with large bowl, small bowl, and juice extractor.

THE G-E AUTOMATIC COFFEE MAKER brews full-flavored, delicious coffee—automatically. Simply press a button—water heats, coffee brews, coffee keeps piping hot, automatically.

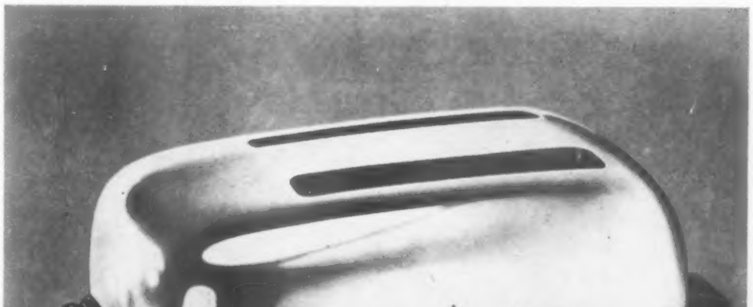
THE G-E AUTOMATIC ROASTER cooks a complete meal for six to eight people. Fully automatic, it bakes, toasts, fries, and steams. Holds a 20-pound turkey. Three-piece utensil set. Temperature range from 150 to 500 degrees F.

THE G-E STEAM IRON converts from steam to dry ironing by merely twisting the control knob. Fabric-Dial controls soleplate temperature.

FOR MODERN HOMEMAKING

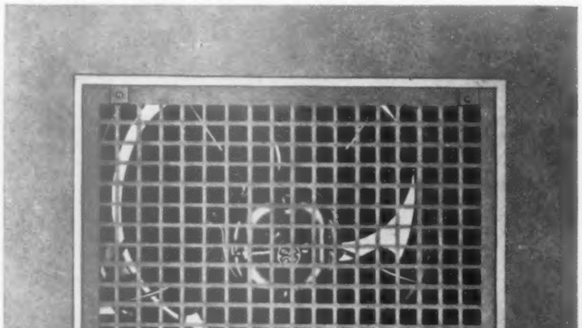
G-E KITCHEN CLOCKS are electrically accurate. Available in several beautiful colors to harmonize with any decorations.

THE G-E SANDWICH GRILL toasts, grills, and fries foods, right at the table. Quick-heating nickel-chromium heating unit. Equipped with interchangeable sandwich grids and waffle grids.



THE G-E AUTOMATIC TOASTER pops toast up or keeps it warm 'til you're ready for it. Makes toast any degree of brownness.

G-E VENTILATING FANS swiftly remove hot, stale air, and make the kitchen airy and pleasant. Available in window or wall-grill models.



HERE'S GENERAL ELECTRIC'S PLAN TO HELP SCHOOLS HAVE THE NEWEST APPLIANCES FOR TEACHING PURPOSES

Under General Electric's plan for sales to educational institutions, home economics departments can have the latest models of General Electric refrigerators, home freezers, ranges, water heaters, dishwashers, Disposalls, kitchen cabinet equipment, and home laundry equipment for instructional purposes. These appliances are available at special, low prices, offered only to schools buying for teaching purposes. New models will be substituted for those in use as quickly as major developments make the change desirable.

For the convenience of buyers of electrical equipment sales contacts with educational institutions will be maintained by General Electric appliance distributors and dealers, and all sales should be made through these organizations.

Educational institutions in the immediate neighborhood of a distributor's headquarters, where service could be provided by the distributor, may deal direct with the distributor's organization. Those at a greater distance, which could be served better by a dealer, will be contacted by the local retail outlet.

The simple agreement, stating the convenient conditions on which the plan is operated, is reproduced on the opposite page. Read it carefully.

GENERAL ELECTRIC
APPLIANCE INSTALLATION AGREEMENT
WITH EDUCATIONAL INSTITUTIONS

An agreement to install General Electric Household Appliances in Domestic Science and Home Economics Departments of Educational Institutions for instructional purposes.

THIS AGREEMENT IS MADE BY AND BETWEEN

(Dealer or Distributor) (City) (State)

And

(Educational Institution) (City) (State)

The dealer or distributor agrees to sell and the Educational Institution agrees to buy General Electric Household Appliances, at a special accredited Educational Institution price as follows:

QUANTITY	PRODUCT	MODEL	PRICE

The above price includes delivery and installation to existing wiring and plumbing, but if special wiring and plumbing are required, it must be done at the expense of the Educational Institution. The price also includes any service required to maintain the above-described appliances in good operating condition for one year except for repairs caused by breakage or replacement due to negligence of the user.

The Educational Institution agrees that the appliances covered by this agreement are to be used only for instructional purposes in Domestic Science or Home Economics Departments.

If the Educational Institution is legally entitled to purchase on a tax-free basis products subject to a Federal Excise Tax, the dealer or distributor will, upon receipt from the Educational Institution of the original copy of a properly executed Federal Excise Tax Exemption Certificate as required by the Bureau of Internal Revenue, submit the certificate through the usual channels to the manufacturer. Any resulting tax credits will be refunded to the school.

The distributor or dealer further agrees that he will replace the above-described appliances with comparable new models as they are released, when in the opinion of the manufacturer changes in new models are of sufficient difference and importance to warrant it. The replacement will be made at no additional cost to the Educational Institution provided the above-described appliances are in good condition, normal wear and tear excepted. Any additional wiring or plumbing expense involved in connection with the replacement will be paid by the Educational Institution.

The Educational Institution shall be responsible for normal care of appliances installed under this agreement and agrees that upon replacement, possession of and title to the General Electric Appliances so replaced will revert to the dealer or distributor.

If for any reason the Educational Institution should desire to have a larger or more de luxe type of product than they have been using, it is agreed that they will pay the difference between the price of the product installed in the Educational Institution and the special accredited Educational Institution price of the higher-priced product.

If for any reason the dealer or distributor is unable to secure replacement appliances through regular channels of distribution and he is prevented from replacing the appliances already installed in the Educational Institution, then no liability will accrue therefor. The dealer or distributor agrees, however, to make such installations or replacements in the manner specified as soon thereafter as is practicable excepting that if he is no longer franchised to handle General Electric Appliances the agreement becomes inoperative.

This agreement is subject to annual renewal with the mutual consent of the Educational Institution and the dealer or distributor.

SIGNED:

(Dealer or Distributor)

By

(Title)

Date

(Educational Institution)

By

(Title)

Date

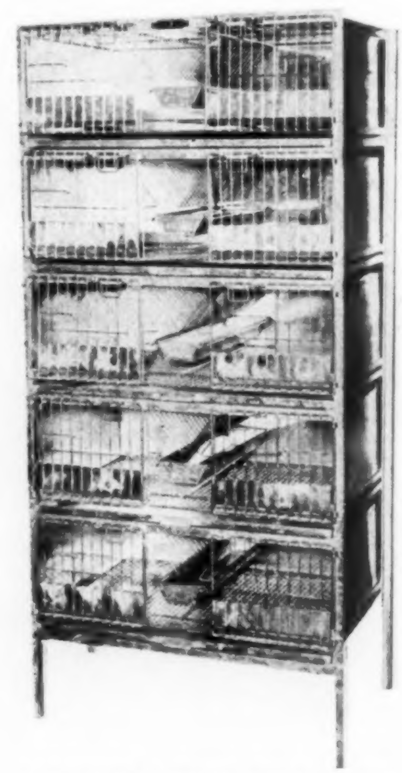
NORWICH WIRE WORKS, INC.

48 Foster Avenue — Norwich, New York

ANIMAL CAGES

Made to order — standard or to your special design — can be furnished for all types of laboratory animals: guinea pigs, rabbits, rats, mice, monkeys, dogs, cats, etc.

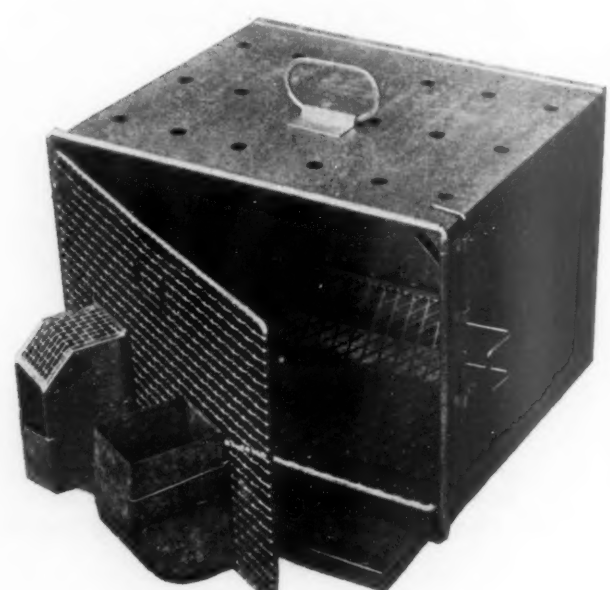
Send for catalogue.



NORWICH TYPE "BV" UNIT
FOR RABBITS AND GUINEA PIGS

NORWICH TYPE "RD-T" UNIT
FOR RATS AND MICE

NORWICH TYPE "RT" METABOLISM CAGE
FOR RATS AND MICE

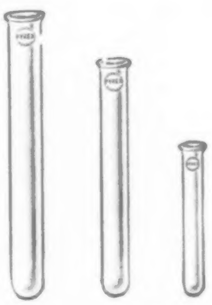


SPECIAL NORWICH TYPE "BR" CAGE
FOR RABBITS

CORNING GLASS WORKS

Corning, N. Y.

PYREX Brand Laboratory Glassware



Test tubes—twenty-two standard sizes from 10 x 75 mm. to 65 x 500 mm.

The physical and chemical characteristics of PYREX brand laboratory glassware are so balanced that all of the properties essential for economy, accuracy and durability are combined and maintained at their maximum value.

STRENGTH

The extremely low thermal expansion coefficient (0.0000032 between 19–350° C.) of PYREX brand chemical glass No. 774 minimizes losses from thermal shock and also permits heavy, rugged construction, thereby increasing resistance to mechanical breakage. The result is greater safety and economies in ultimate glassware costs.

STABILITY

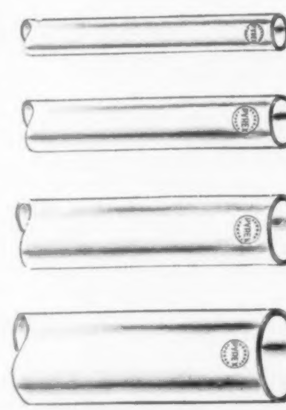
The low alkali characteristics and the high chemical durability of PYREX brand chemical glass safeguards the accuracy of your analyses.

DEPENDABILITY

Laboratory control is exercised in every phase of production from raw materials to finished product. This assures you of the consistent quality and uniform dependability which users associate with PYREX brand glassware.

AVAILABILITY

PYREX brand laboratory glassware is stocked by all leading laboratory supply dealers. Call on your dealer for your PYREX requirements. He is prepared to serve you.



Glass tubing—standard wall in 4 ft. lengths, O.D. from 3 to 100 mm. Also capillary tubing and solid rod

Beakers — for every purpose — over 40 different capacities in 8 standard types

Funnels — PYREX brand fluted funnels materially cut filtering time, give full support to filter paper. Molded to an accurate 60°, sturdily built for student use

Flasks — Erlenmeyer narrow mouth, capacities from 10 to 6000 ml.

Cylinders — plain or graduated cylinders up to 4000 ml. capacity. Sturdy hexagonal bases, heavy beaded top rims assure longer service life

Thistle tubes—molded construction and heavy stems for uniformity and strength spell greater safety for school laboratories

AMERICAN OPTICAL COMPANY

American Optical COMPANY
Scientific Instrument Division
Buffalo 15, New York

BRANCH OFFICES

NEW YORK	CHICAGO	WASHINGTON
BOSTON	SAN FRANCISCO	LOS ANGELES
DALLAS	COLUMBUS	ST. LOUIS
PHILADELPHIA	PITTSBURGH	ATLANTA

MICROSCOPE NO. 66B

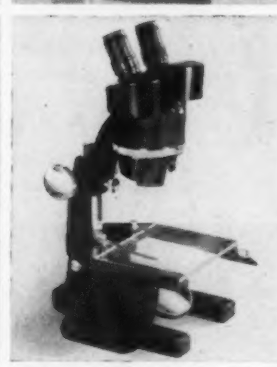
A simple, sturdy instrument for elementary biology classes. It has the same high quality optics and mechanical features as higher priced models. Features include: micrometer screw-type fine adjustment, course adjustment, 110 mm x 115 mm stage, dual-cone double revolving nosepiece, revolving disc diaphragm, 16 mm and 4 mm objectives, 10X eyepiece. Other optics available.

MICROSCOPE NO. 26

A Stereoscopic (Low Power, Wide Field Binocular) Microscope. Provides three dimensional effect, erect image and wide field of view. Valuable for examining flowers, plants, insects, molds, minerals. For reflected light only. It may easily be converted to a No. 25 for use with transmitted light.

MICROSCOPE NO. 63B

A laboratory type instrument suitable for elementary and advanced work. Features include: large research-type stand, micrometer screw-type fine adjustment, 125 mm square stage, dual-cone double revolving nosepiece, iris diaphragm, 16 mm and 4 mm objectives, 10X eyepiece. Other available equipment: optics, condenser, triple revolving nosepiece, mechanical stage.

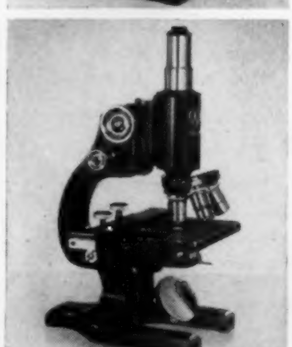


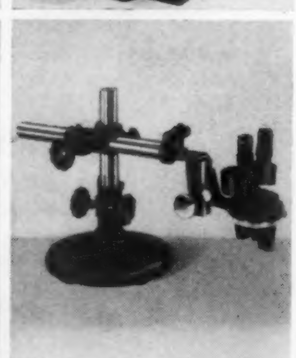
MICROSCOPE NO. 25

This Stereoscopic Microscope is similar to No. 26 with the addition of a V base and mirror for use with transmitted light. There is a wide selection of optical equipment and choice of inclined or vertical binocular bodies.

MICROSCOPE NO. 33MH

The standard instrument for advanced instruction in biological sciences and medicine. Features include: micrometer screw-type fine adjustment, 125 mm square stage, mechanical stage, dual-cone triple revolving nosepiece, fork-type substage, Abbe condenser N.A. 1.25 with iris diaphragm, 16, 4, 1.8 mm objectives, 6X and 10X eyepieces.



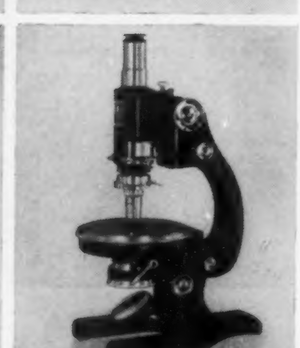


MICROSCOPE NO. 23

A Stereoscopic Microscope for examining large objects not conveniently placed on a microscope stage. Swivel-mounting of binocular body permits rotation to most convenient position for observation. Low mounting of objectives allows inspection of objects in a deep dish.

MICROSCOPE NO. 13MLH

An inclined binocular instrument for research and extended observation. Features include: micrometer screw-type fine adjustment, 125 mm square stage, mechanical stage, dual-cone revolving nosepiece, fork-type substage, Abbe condenser N. A. 1.25 with iris diaphragm, 16, 4, 1.8 mm objectives, 6X and 10X eyepieces.



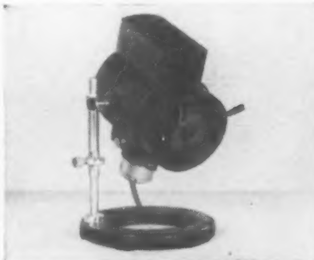
MICROSCOPE NO. 43

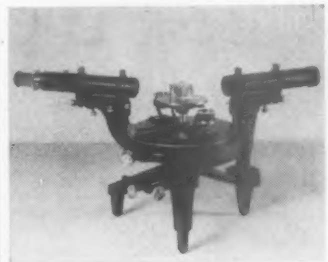
A complete Polarizing Microscope at a minimum price made possible through use of a newly perfected Polaroid. Features include: full size stand, graduated micrometer screw-type fine adjustment, choice of quick-change or revolving nosepiece, revolving stage, condenser N.A. 1.0 in graduated, rotatable mount. Many other models available.

Manufacturers of the **SPENCER** *Scientific Instruments*

MICROSCOPE LAMP NO. 370

An adjustable illuminator for a wide range of laboratory uses: general microscopy, dark field illumination, photomicrography. It has a silvered reflector, double condenser system, iris diaphragm.



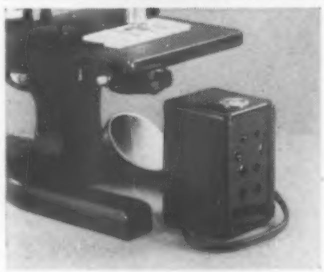


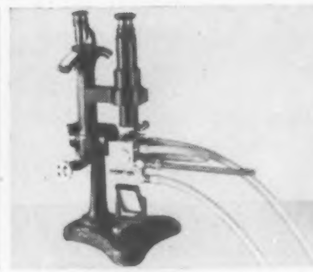
DIVIDED CIRCLE SPECTROMETER

Valuable for teaching basic optical concepts. Measurements of prism angles, refractive index, dispersion, and wave length can be done with precision. Accessories include a comparison prism for observing two spectra simultaneously, a camera attachment, a choice of three glass prisms, and a hollow prism for use with liquids.

MICROSCOPE LAMP NO. 385

A simple, compact lamp giving ample illumination for most work. For use with or without microscope substage mirror. Sturdy Bakelite construction.



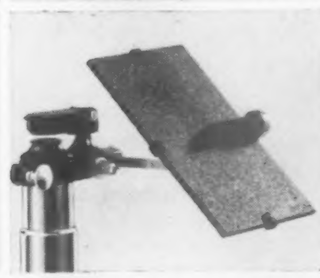


ABBE REFRACTOMETER

For quick, accurate determination of refractive index and dispersion of liquids and solids. Available with 3 types of scale: Standard Abbe, Sugar, High Index — each supplied either with or without Amici compensating prisms.

MICROSCOPE LAMP NO. 353

A compact, powerful light source for Kohler illumination, low power inspection, physics experiments, general "spot" illumination, photography. Available with jackknife standard and base, optical base attachment, and adapter for ring stand.



CAMERA LUCIDA

This instrument enables the observer to make an accurate drawing of the object seen with the microscope.

MICROSCOPE LAMP NO. 361

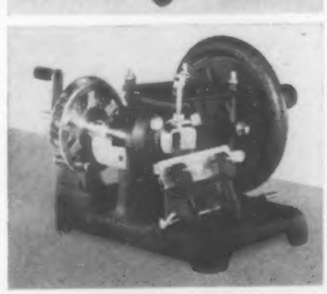
A chalet type light source giving sufficient illumination for binocular microscopes with objectives of high magnifying power. Well ventilated for comfort in handling. A visor shields the eyes.

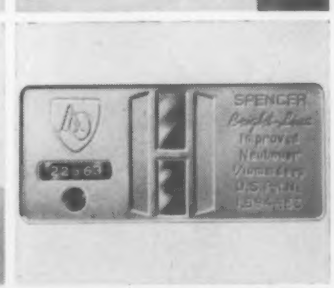
DEMONSTRATION EYEPIECE

Replaces the standard microscope eyepiece with widely separated eyepieces through which two persons can view the same field at the same time. Valuable for quizzes and study. A movable pointer is visible in both eyepieces.

MICROTOME NO. 810

A moderately priced instrument with the unique Spencer feed mechanism which is independent of the vertical movement—thus protecting the feed mechanism from shock. Feeds sections 2 to 40 microns in thickness. Total excursion is 22 mm. Ball and flange type object clamp. Rigid knife holder with adjustable cutting angle.



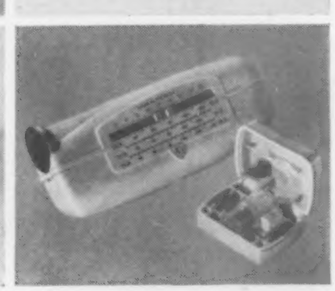


BRIGHT-LINE HAEMACYTOMETER

A glass chamber for making blood counts as well as yeast counts, dust counts, and other determinations. Unique metallized background improves the contrast and helps increase accuracy of counts.

MICROTOME NO. 820

The outstanding instrument for critical serial sectioning. Massive and rigidly built. Feed mechanism is independent of vertical movement. Critical setting for thicknesses from one to fifty microns. Total excursion of feed is 28 mm. Ball and flange type object clamp. Double clamp knife holder with wide range of cutting angles.



Hb-METER

For hemoglobin determinations of laboratory accuracy in less than three minutes. May be used conveniently anywhere. Operates from built-in, battery-operated light source or from 110-120 volt outlet.

Manufacturers of the **SPENCER** *Scientific Instruments*

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Sao Paulo, Brazil

A MICROSCOPE

The Bausch & Lomb Model A Microscope is particularly recommended for use in elementary Botany, Zoology, and Biology classes in high school or college.

Its simple construction makes it the ideal instrument for the hard usage received in classroom service. Its optics are of the precision type.

Its features include the following: Vertical Monocular Body. Standard B&L rack and pinion coarse adjustment with patented lever type side fine adjustment. Designed to take spiral focusing sleeve substage adapting it to use with oil immersion objectives and making possible complete utilization of the full optical capabilities of the lower and intermediate power objectives. Revolving, dustproof nosepiece, centered and parfocalized at the factory.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A. and 43X (4 mm) 0.65 N.A. Double Nosepiece—Huygenian Eyepiece 10X. Cat. No. 31-21-40-02.

BAV MICROSCOPE

The Bausch & Lomb Model BAV Microscope is similar to the Model A but is equipped with the *new* Variable Focus Condenser and other features for more advanced work. A standard instrument in many hospital and professional laboratories, and a basic model in industrial and commercial laboratories, it is not only an ideal instrument for the teaching of microscopy, but it also familiarizes the student with the instrument he will be called upon to use in later professional or business life. Features include a built-on mechanical stage which holds slides 50 x 75 mm, permitting scanning of entire area, rack and pinion substage with Variable Focus Condenser in full ring mount, complete adaptability to a wide range of accessories.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A. 43X (4 mm) 0.65 N.A. and 97X (1.8 mm) Oil Immersion 1.25 N.A. Triple Nosepiece—Huygenian Eyepieces 5X and 10X, Variable Focus Condenser. Cat. No. 31-21-58-08.

CTAV MICROSCOPE

This microscope is especially adapted for advanced Biological work, for Medical Study and Diagnosis and as a general purpose microscope in universities. Has 30° inclined binocular body (interchangeable with monocular tube for photomicrography) with parallel eyepiece tubes. Built-on mechanical stage holds slides 50 x 75 mm, permitting examination of the entire area. New Variable Focus Condenser in full ring mount is in rack and pinion substage. Revolving, dustproof nosepiece, centered and parfocalized at the factory. Optical equipment of uniform high excellence includes achromatic and fluorite objectives.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A., 43X (4 mm) 0.65 N.A. and 97X (1.8 mm) Oil Immersion 1.25 N.A. Triple Nosepiece—Huygenian Eyepieces 5X and 10X, Variable Focus Condenser Cat. No. 31-21-91-08.

FB MICROSCOPE

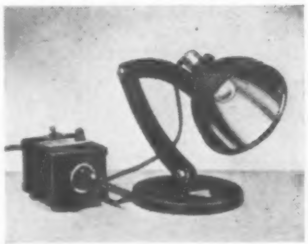
The model FB Microscope is designed to provide schools and colleges with a standard size microscope suitable for elementary biological work at an economical price. The features of this microscope provide for maximum usefulness while permitting sound microscopical training. A disc diaphragm, fitted below the stage, permits control of illumination. Standard B&L Achromatic Objectives and Huygenian Eyepieces are provided. Has double revolving nosepiece; large, adjustable, concave mirror for axial or oblique illumination; rugged fine adjustment.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A., 43X (4 mm) 0.65 N.A. Double Nosepiece—Huygenian Eyepiece 10X. Cat. No. 31-21-17-02.

KW TYPE STEREOSCOPIC MICROSCOPE

The great popularity of the KW Type Stereoscopic Microscopes has prompted us to offer them for use in schools and universities. Their range of magnifications, from 7X to 150X, especially suits them for biological and paleontological work. An interesting feature of this series is the patented vertically revolving drum nosepiece, holding three pairs of parfocal objectives in readiness to be swung instantly into place. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed in exactly the same position it would be seen by the naked eye. Exceptionally wide field.

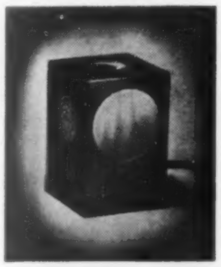
B&L REFLECTOR LAMP



This lamp fills a definite need in work with both the monocular or binocular mon-objective microscope and the stereoscopic wide field microscopes. Elliptical mirror reflector with adjustment provides diverging, parallel or converging light.

Jointed arm mounting permits all-angle illumination above or below stage. With adjustable transformer, light intensity can be exactly fitted to the work in hand.

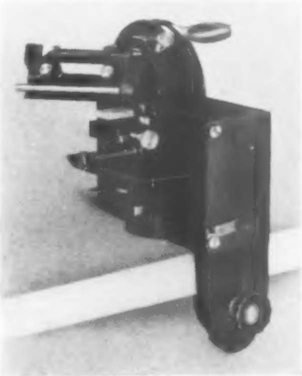
OTHER MICROSCOPE LAMPS



Other B&L Microscope Lamps are available for various purposes in the school laboratory. The ones shown are the B&L Spherical and the B&L Substage Lamps.

The entire group is completely described and illustrated in Catalog D-119.

B&L MICROTOMES



The B&L Improved Clinical Microtome provides several desirable and exclusive operating advantages. It is a practical laboratory instrument, fitted for rapid and accurate sectioning of frozen, celloidin and paraffin material. Knife travel and feed are automatic, both being driven by a balanced handwheel of sufficient mass to insure smooth action on all material and section thicknesses of 5 to 75 microns in steps of 5 microns. Sheet D-165 describes this microtome.

B&L SPECTROGRAPHS

The complete B&L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope (illustrated) for elementary class room work to the Large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-26 and D-20 give complete details.

B&L MAGNIFIERS

Of great usefulness in the school laboratory, Bausch & Lomb Hastings Triplet Magnifiers are highly corrected for spherical and chromatic aberration, and have a wide angle of view as well. Magnifications available range from 7X to 20X. Other types of magnifiers for various purposes are available. Catalog I-15.

SEND FOR CATALOGS

For complete information on Laboratory Microscopes and Accessories send for Catalogs D-185 and D-184. For information on Research Microscopes ask for Catalog D-173 and D-101. Catalog D-15 gives information on Stereoscopic Wide Field Microscopes. For information on B&L Balopticons see pages 416, 417 this catalog. Remember the instruments listed on these pages are but a small part of the B&L Line. If you have need for information on any optical products, Bausch & Lomb will gladly be of service to you.

THE EATON-DIKEMAN COMPANY

Manufacturers of Filter Papers

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LABORATORY FILTER PAPER FOR SCHOOLS, COLLEGES AND INDUSTRIES

FOR USE IN HEAVY AND LIGHT FUNNEL WORK, FILTER PRESSES AND FILTER MACHINES

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The Eaton-Dikeman Company, established in 1893, is today the world's largest manufacturer of quantitative, qualitative, and industrial filter papers; carrying in stock more than ninety grades of a quality that is dominated by the uniformity and purity that is found only in papers processed under a strict laboratory control and in a locality famous for the purity of its water and freeness from industrial and aerial pollutions.

The Eaton-Dikeman trademark assures you of a filter paper that is made from pure spring water free from chemicals and salts, that, if present, would prove harmful to many operations.

Eaton-Dikeman laboratory filter papers are sold by all laboratory supply dealers under their own special labels, as well as E & D labels. To be sure of obtaining E & D Quality, it is best to ask for the E & D label.

The qualitative grades are sixteen in number and are best described in our Descriptive Booklet No. 1, which we shall be glad to send you on request.

EATON-DIKEMAN'S NEW PURITY SERIES

The New Filt and Purity Series have been combined in the Purity Series and the complete line is numbered 1-4-5-7-048-248-604 and our new Descriptive Booklet No. 3 will give you the filtering characteristics of the different numbers.

These papers are made of the very highest quality of pure cotton fibre and are specially treated and processed to insure a high degree of purity and a low ash weight.

These papers have been approved by many testing laboratories and are being used in industrial laboratories throughout our country, Canada and Mexico.

E & D FOLDED FILTER PAPER

Uniformity and purity, plus precision and speed make E & D folded papers the international standard.

The grades described below are stocked in all standard sizes 12.5 cm. to 60 cm.

The No. 192 grade is rapid, yet retentive.

No. 193 is medium fast, very retentive.

No. 195 is very rapid.

The No. 522 grade is highly retentive, good for general purposes.

E & D folded filter paper retains the fold in the funnel and the apex is full rounded, permitting an even distribution of the load, thereby preventing breakage at this point.

Packed 100 in a box. Samples sent on request. Ask for Descriptive Booklet No. 1.

E & D Qualitative and Quantitative papers are packed 100 circles to a box all sizes up to 20″ diameter.

LINTLESS—HIGH WET STRENGTH PAPER

E & D No. 950, No. 952, No. 954 are specially treated, hardened filter papers. Will not give off lint, possess exceptional wet strength.

OUR DESCRIPTIVE BOOKLETS NOS. 1, 2, 3 WILL GIVE YOU A COMPLETE FILE ON LABORATORY FILTRATIONS. SENT GRATIS ON REQUEST

PHYSICAL CHARACTERISTICS OF E & D PAPERS

Grade	Thickness	Basic Weight	Color	Surface	Texture	Average Rapidity
603	0.010″	32 lbs.	White	Smooth	Close	50 cc per Min.
605	0.007″	28 lbs.	White	Smooth	Close	50 cc per Min.
608	0.013″	40 lbs.	White	Embossed	Very Close	25 cc per Min.
611	0.004″	16 lbs.	White	Smooth	Very Close	65 cc per Min.
612	0.008″	20 lbs.	White	Embossed	Med. Close	60 cc per Min.
613	0.006″	20 lbs.	White	Smooth	Very Close	60 cc per Min.
615	0.010″	20 lbs.	White	Creped	Fairly Open	225 cc per Min.
616	0.015″	28 lbs.	White	Creped	Open	400 cc per Min.
617	0.018″	35 lbs.	White	Creped	Open	375 cc per Min.
619	0.010″	20 lbs.	Grey	Creped	Fairly Open	275 cc per Min.
620	0.009″	20 lbs.	Grey	Creped	Fairly Close	60 cc per Min.
622	0.006″	20 lbs.	White	Embossed	Close	40 cc per Min.
622	0.006″	20 lbs.	Grey	Embossed	Close	30 cc per Min.
623	0.026″	70 lbs.	White	Smooth	Med. Close	200 cc per Min.
623	0.030″	78 lbs.	White	Smooth	Med. Close	170 cc per Min.
623	0.038″	95 lbs.	White	Smooth	Med. Close	130 cc per Min.
624	0.022″	63 lbs.	White	Smooth	Close	160 cc per Min.
625	0.026″	70 lbs.	White	Smooth	Close	160 cc per Min.
625	0.030″	78 lbs.	White	Smooth	Close	160 cc per Min.
627	0.023″	65 lbs.	White	Smooth	Close	120 cc per Min.
627	0.026″	75 lbs.	White	Smooth	Close	100 cc per Min.
627	0.030″	85 lbs.	White	Smooth	Close	80 cc per Min.
628	0.026″	75 lbs.	Tan	Embossed	Med. Close	100 cc per Min.
628	0.035″	95 lbs.	Tan	Embossed	Med. Close	60 cc per Min.
629	0.012″	35 lbs.	White	Smooth	Med. Close	120 cc per Min.
632	0.042″	84 lbs.	White	Creped	Close	60 cc per Min.
633	0.042″	70 lbs.	White	Creped	Open	400 cc per Min.
633	0.045″	75 lbs.	White	Creped	Open	350 cc per Min.
634	0.030″	54 lbs.	White	Creped	Med. Open	450 cc per Min.
637	0.013″	28 lbs.	White	Creped	Open	700 cc per Min.
640	0.022″	44 lbs.	White	Creped	Open	450 cc per Min.
641	0.014″	41 lbs.	White	Smooth	Close	180 cc per Min.
652	0.050″	150 lbs.	White	Smooth	Very Close	25 cc per Min.
655	0.005″	15 lbs.	White	Creped	Med. Close	275 cc per Min.
301	0.030″	90 lbs.	White	Smooth	Close	70 cc per Min.
301	0.050″	145 lbs.	White	Smooth	Close	50 cc per Min.
320	0.090″	225 lbs.	White	Smooth	Very Open	200 cc per Min.

NOTE: In above description "**basic weight**" is for 500 sheets per ream size 20″ x 20″. Rapidity is the number of cubic centimeters of distilled water at 25° centigrade filtered per min. through 2″ hole using a 2″ head.

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ALBERENE SOAPSTONE (Regular Grade)

Natural quarried stone of medium hardness having an abrasive hardness factor of ± 5 blue-gray in color, produced and fabricated for more than 50 years; used in increasing quantities for:

Table Tops and Backs
Reagent Shelving
Fume Hoods, Gutters
Sinks, Drainboards
Toilet Partitions
Shower Compartments
Interior and Exterior Trim
Window Sills and Stools
Fireplace Linings, Hearths
Spandrels, Mullions, etc.

GRADE 25 ALBERENE

Variety of extremely hard stone, especially selected for laboratory working surfaces. Takes a permanent high sheen when rubbed down with oil. Abrasive hardness factor, 20-40, National Bureau of Standards tests.

ALBERENE TREAD STOCK (GRADE 25)

Selected stone of high hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring and thresholds. Tests show an abrasive hardness factor of 20-40, the highest durability factor on the National Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

ALBERENE BLACK SERPENTINE

This natural stone has become extremely popular. Its great resistance to weather action makes it especially desirable for exterior work. When sand-blasted (as in spandrels) the fine tracery of the designs stands out against the polished black surface. Abrasive hardness factor, 30-45, National Bureau of Standards tests.

ALBERENE TREMOLITE

An interesting addition to the line. Polishes to a dark blue. Abrasive hardness factor, 20-30, National Bureau of Standards tests.

PHYSICAL AND CHEMICAL PROPERTIES

All grades of Alberene Stone are homogeneous and finely granular in all directions, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling.

LABORATORY FIXTURE CONSTRUCTION

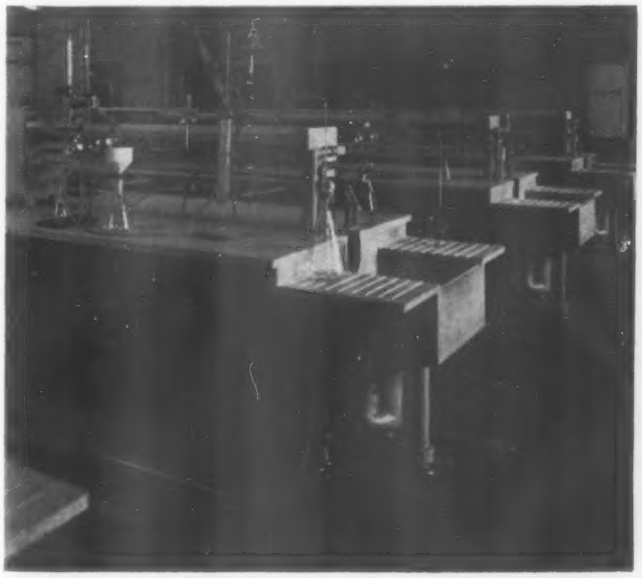
Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 50 years has used Alberene soapstone wholly or in large part. We have the experience to assist you in rearranging, moving, or adding new facilities.

MANUFACTURING FACILITIES

Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.



Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.

Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect

THE DURIRON CO., INC.

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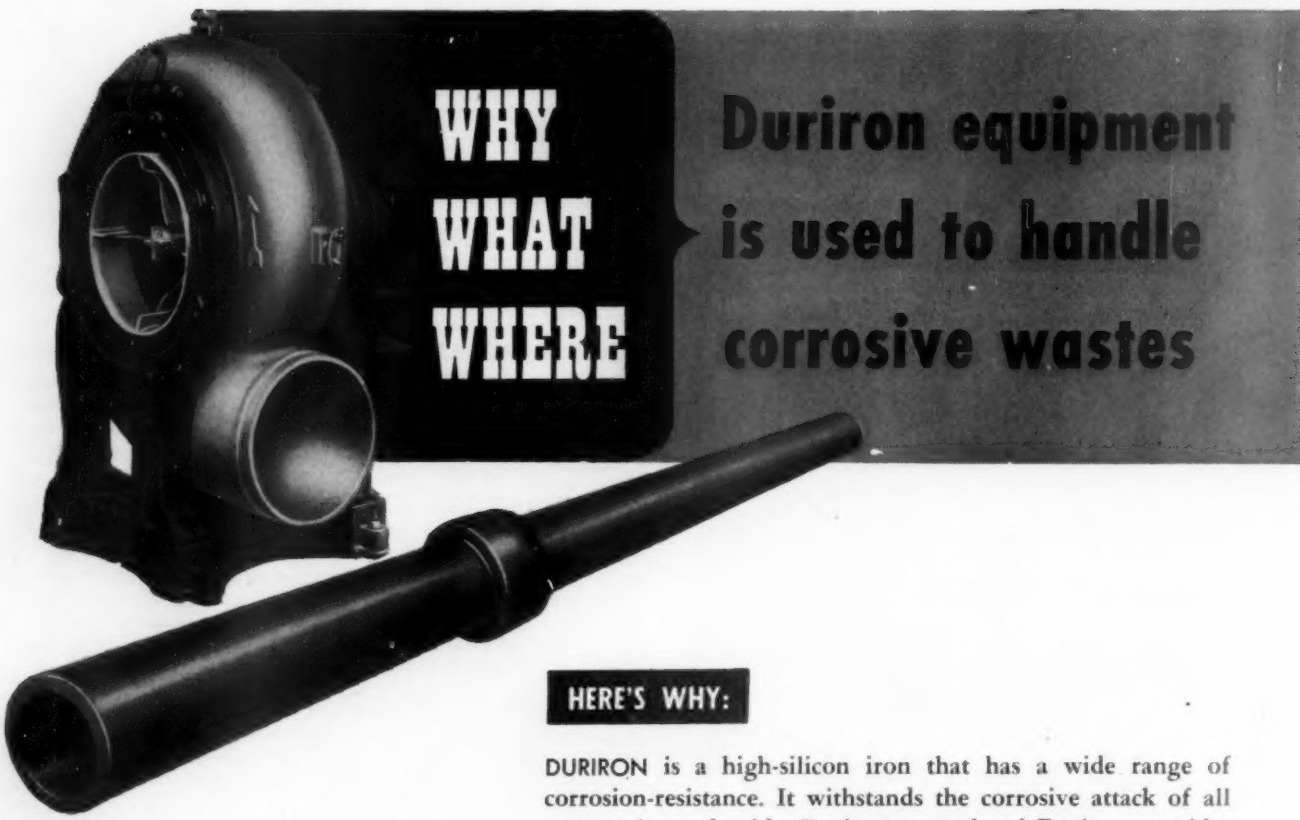
DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT



HERE'S WHY:

DURIRON is a high-silicon iron that has a wide range of corrosion-resistance. It withstands the corrosive attack of all commonly used acids. Equipment made of Duriron provides permanent safe-exit for all laboratory corrosives.

HERE'S WHAT:

DURIRON BELL AND SPIGOT DRAIN PIPE AND FITTINGS available in 1½", 2", 3", 4", 5", 6" and 8" sizes. 10", 12" and 15" furnished to order. Working dimensions same as cast iron. Ask for Bulletin 703.

DURIRON EXHAUST FANS — Built in five sizes, providing a capacity range from 20 to 5,000 CFM. Ask for Bulletin 1102.

DURIRON LABORATORY SINKS
SINK STRAINERS
FLOOR DRAINS
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} Details in Bulletin 703
PUMPS, VALVES, FLANGED PIPE

HERE'S WHERE:

CHEMICAL LABORATORIES: Laboratory sinks, sink outlets, traps and drains.

KITCHENS, X-RAY DARK ROOMS: Sink outlets, traps and drains.

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Case School of Applied Science, Rockefeller Met. Lab.
Columbia University
Cornell University
Duke University
Massachusetts Institute of Technology
McGill University, Montreal
New York University
Rochester Institute of Technology
Southern Methodist University
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Manufacturers of Acid-Proof Chemical Stoneware and Porcelain Laboratory Equipment

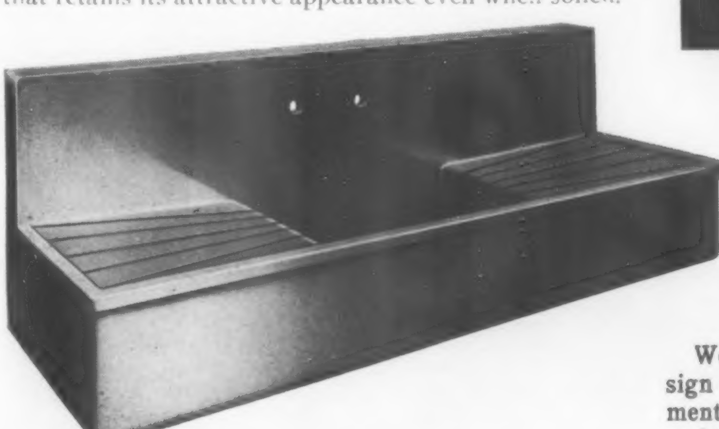
A complete line of acid-proof chemical stoneware and porcelain equipment for chemistry and physics laboratories in educational and research institutions for general industrial chemical purposes, and for hospitals, electroplating plants, newspapers, photo-engraving shops and other establishments where corrosive fluids are used. The line includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps and ventilating fans.

A list of colleges and universities with chemical laboratories equipped with General Ceramics Chemical Stoneware and Porcelain is practically a roster of our leading institutions of learning. Installations have also been made in Walter Reed Hospital, Washington, Curtis Publishing Company in Philadelphia and New York, The Times Building and United States Assay Office.

Chemical Stoneware

General Ceramics Chemical Stoneware is a dense granite-like material with an attractively glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. It is mechanically strong, leakproof, easy to clean and lasts indefinitely.

General Ceramics one piece construction has the advantage of eliminating joints, the sinks being made in one piece with integral drainboard, backs, tail piece, overflows, traps, etc., as desired. The sink bottoms are made with a fall toward the outlet to insure complete drainage. There are no sharp corners at the sides and bottom, as these are rounded to facilitate cleaning. The glaze is an integral part of the body and will not craze or peel and gives a smooth attractive finish that will not accumulate slime and is easy to keep clean. The color is a rich chocolate brown that retains its attractive appearance even when soiled.



Laboratory sink with double drainboard in either Chemical Stoneware or Porcelain. Can be furnished without the integral back, with single drainboard and with details of construction as required

Cerawite Chemical Porcelain

Cerawite is a new chemical porcelain, completely vitrified, high fired, non-porous. Has greater mechanical strength and resistance to thermal shock than

Laboratory sink, Chemical Stoneware or Porcelain, with integral back and side. Can be furnished without back and side in various types and sizes as required

it has been possible heretofore to combine in one ceramic body. This corrosion resistant body withstands extremely stringent conditions.

Engineering Service

We offer competent engineering service in the design of stoneware, porcelain or special chemical equipment and in the planning and layout of laboratories and in other buildings where corrosive products are handled. Bulletins on General Ceramics laboratory sinks and on acid-proof pipe and fittings will be furnished on request.

MAURICE A. KNIGHT

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One-Piece Laboratory Sinks
Acid-Proof Table Troughs
Neutralizing Sumps
Tanks, Jars, Filters, etc.

KNIGHT-WARE CHEMICAL EQUIPMENT

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Purdue University
Ohio State University
Brooklyn College
Princeton University
Northwestern University
University of Arkansas
University of Washington
University of California
University of West Virginia
Mellon Institute of Industrial Research

KNIGHT-WARE

Knight-Ware is an improved ceramic material that is dense, tough and wholly inert to the action of chemical solutions or gases, weak or strong, hot or cold (Hydrofluoric acid and hot caustic solutions excepted). Its acid-proof quality does not depend upon any glaze or surface treatment. "It is the body itself" that is entirely acid-proof. Knight-Ware equipment, properly installed, is trouble-free and permanent.

LABORATORY SINKS

Knight-Ware sinks are custom-made to specified measurements without extra cost. The one-piece construction, smooth surfaces, rounded corners and acid-proof quality mean a freedom from leaks and a cleanliness that is permanent. Splash backs, drainboards, aprons and outlets of several styles may be had as integral parts of the sink. Bottoms are sloped to insure complete drainage. The finish is a rich brown salt glaze that will not stain or peel.

ACID WASTE PIPE AND FITTINGS

Knight-Ware pipe and fittings are made in standard designs in any bore from 1 to 60 inches and straight lengths up to 5 feet. Special pieces to fit unusual places or to eliminate extra joints are available at low cost. Knight-Ware pipe is light in weight, strong and acid-proof.

Joints, packed and poured to our specifications, are tight and lasting.

KNIGHT-WARE FUME DUCTS

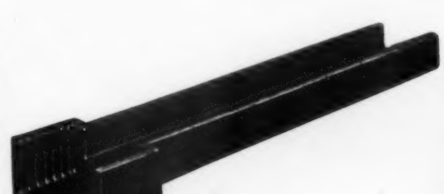
Ventilating pipe is available in round or rectangular shapes in bores up to 60 inches and with bell and spigot, flanged or plain butt end connections. Specify Knight-Ware for lasting protection.

PERMANITE ACID-PROOF FLOORS

PERMANITE Floors are designed for rugged endurance as well as acid resistance. They are constructed of special non-skid vitrified brick bonded by PERMANITE Cement.

PERMANITE Floors are easily cleaned and will withstand steam sterilization, strong alkali cleaners, oils, greases and most acids.

Fig. 237 RD Sink with right hand drainboard. Available with left hand or double drainboards and apron.



275A Table Trough

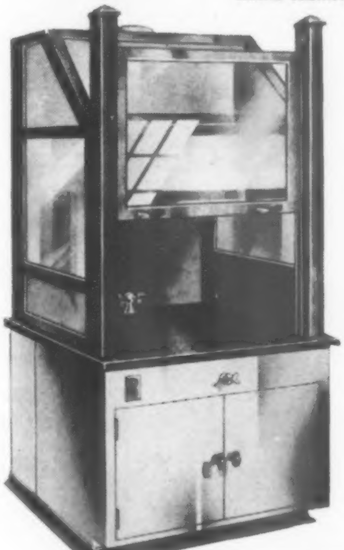
268 Knight-Ware S-Trap with Cleanout

OUR FULLY ILLUSTRATED LABORATORY EQUIPMENT CATALOG WILL BE SENT UPON REQUEST

LABORATORY FURNITURE COMPANY, INC.

37-22 Northern Blvd., Long Island City 1, N. Y.

FIREPROOF STEELAB FURNITURE — STRENGTH OF STEEL — ENDURANCE OF LEAD



CHEMICAL FUME HOOD SH38C single sash, inclosed cabinet support.

INSTRUCTOR'S DESK No. 8250 recessed service fixtures.

NEW

SCHOOL LABORATORY EQUIPMENT BUILT TO INDUSTRIAL LABORATORY SPECIFICATIONS

not an adaptation . . .

Feature by feature, every characteristic of STEELAB school laboratory equipment is 100% professional! It is made to precisely the same specifications as STEELAB industrial laboratory equipment, which has served through more than 20 years of peace and war, in America's outstanding laboratories.

STEELAB has over 25,000 installations on record *without* extensive repairs — *with* minimum maintenance.

Fireproof, permanent, almost indestructible STEELAB has been time-tested under extreme conditions, proving itself the most dependable value for your appropriation.

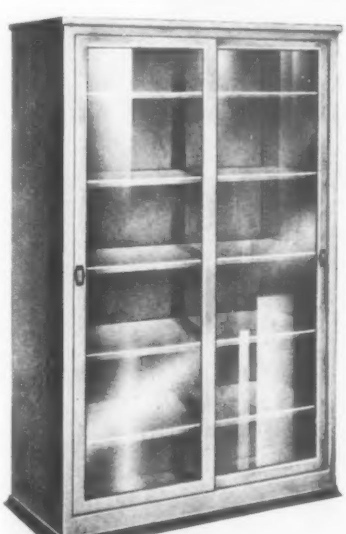
Products Manufactured

TABLES — *Science, Physics, Chemistry, Biology, Home Economics, Manual Arts, Geology, Lecture, Demonstration, Instructors, Balance, Dark Room Developing, Bacteriology, Microscope, Medical, Research, Private Laboratory.* **CASES AND CABINETS** — *Chemical, Apparatus, Instrument, Glassware, Microscope, Museum, Specimen, Acid Storage, Map and Chart.* **CHEMICAL FUME HOODS (OPEN AND CLOSED TYPES)** — *Air Conditioned, complete with exhaust fans and ducts. Also* **ACID-PROOF SINKS AND TANKS** *and* **SPECIAL LABORATORY FITTINGS AND ACCESSORIES.**

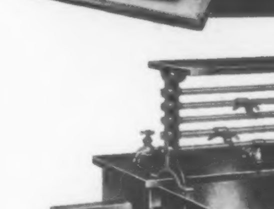
ENGINEERING SERVICE

Why not avail yourself of our Engineering Service which we will gladly furnish without obligation? This includes discussion of your problems, preparation of plans and specifications, and budget estimates.

Whether your problem is to plan a new project or add to the student accommodation of your present facilities our service will prove to be of valuable assistance.



GLASSWARE CABINET No. 5800, 5 full-size adjustable steel shelves, sliding glass doors.



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QUANTITATIVE and INORGANIC CHEMISTRY, 8-student center table, No. 7170.

METALAB EQUIPMENT CORP.

1529–1535 Dean Street, Brooklyn 13, N. Y.

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NEW HORIZONS *In* EDUCATIONAL LABORATORIES

All Metalab products are designed and built to withstand the wear and hard usage of busy laboratories, as well as corrosion, resulting in many years of usefulness and service.

Metalab is in a position to meet all your requirements easily and economically.

Rapid advancement is being made in Industrial Research, Development, and Control. Modernized equipment to be used in conjunction with the latest teaching methods, in order that schools and institutions will give the student the benefit of using equipment on a par with that which he will find in the industrial field, in so far as quality and ruggedness is concerned, and still stay within your budget.

The Metalab line of school laboratory equipment is complete and includes the following:

TABLES—Science, Physics, Chemistry, Biology, Home Economics, Manual Arts, Geology, Lecture, Demonstration, Instructors, Balance, Dark Room Developing, Bacteriology, Microscope, Medical, Research, Private Laboratory. CASES AND CABINETS—Chemical, Apparatus, Instruments, Glassware, Microscope, Museum, Specimen, Acid Storage, Map and Chart. CHEMICAL FUME HOODS (OPEN AND CLOSED TYPES)—Complete with exhaust fans and ducts. Also ACID-PROOF SINKS, TANKS and SPECIAL LABORATORY FITTINGS AND ACCESSORIES.

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Sectional Units are the basis of the Metalab line, thereby giving you the finest in material and construction at a production line cost.

PLANNING SERVICE—In order to utilize your classrooms to their best advantage, send your layout problems to us for study by our Engineering Dept. and for recommendations and proposals. This service does not involve any obligation on your part.

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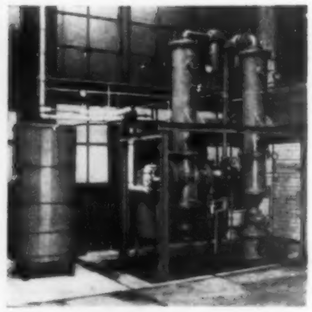

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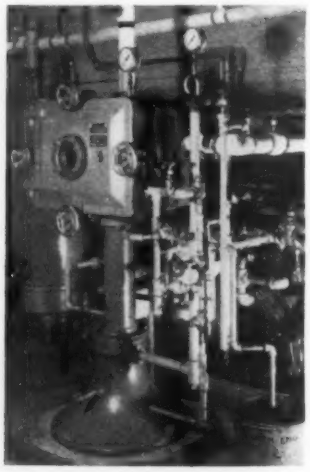

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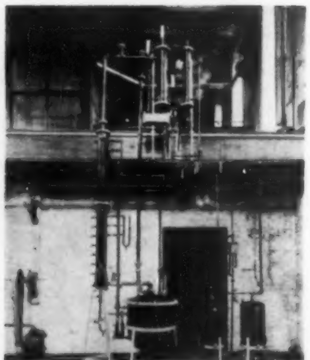

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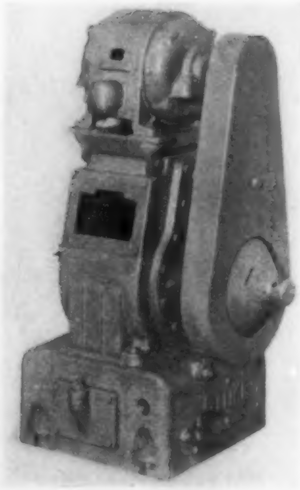

HIGHER VACUUM

Since industry has shown an increasing tendency to use higher vacuum processes, colleges and universities have found it necessary to install adequate equipment for this specialized work.

Stokes has supplied much of the research and commercial high vacuum equipment for drying penicillin, plasma, streptomycin and biologicals by sublimation. They also supply equipment for distillation, fractionating, drying and impregnation.

For high vacuum equipment adapted to teaching, research or demonstrating actual manufacturing technique . . . call on Stokes.

EVAPORATORS

Fig. 1 — Double effect evaporator. Either effect can be operated independently; second effect arranged for crystallizing. Gages, testers, thermometers and measuring tanks permit recording comprehensive data on variety of operations. Many standard and laboratory sizes.

VACUUM SHELF DRYER

For drying products sensitive to heat or oxidation, and for solvent recovery.

SIZES AND SPECIFICATIONS — No. 130 VACUUM SHELF DRYERS OR IMPREGNATORS

Model	Shelf Size (Inches) Width x Depth	Inside Height Chamber (Inches)	Usable Shelves	Shelf Area Sq. Ft.
51	12 x 18	12	2	3
138B	24 x 24	16	2-6	8-24
138D	24 x 36	23	3-9	18-54
138F	24 x 36	35	4-12	24-72
138H	44 x 40	44	5-15	61-173
138J	44 x 40	65	8-22	97-258

Fig. 2 — Model 51 vacuum shelf dryer with 3 sq. ft. of shelf area. Vertical surface condenser and receiver built into base.

FRACTIONATING COLUMN

Fig. 3 — Can be operated at atmospheric pressure or under vacuum. Double receiver permits separation of fractions distilled over. By-pass column permits straight distillations. Full range of sizes.

STOKES MICROVAC HIGH VACUUM PUMPS

For higher vacuum research, within a few microns of absolute, laboratories find Stokes Microvac Pumps best because they are rugged, simple and foolproof, with high mechanical and volumetric efficiencies. Only four moving parts. Oil clarification equipment can be supplied. Send for bulletin No. 463.

SPECIFICATIONS—MICROVAC PUMPS

			MOTOR	
Model Number	Cap. cu. ft.	Speed R.P.M.	H.P.	Speed R.P.M.
146	15	500	1	1800
148	30	370	1½	1200
149	60	385	3	1200
212	115	385	5	1200
412	235	400	7½	1200

Fig. 4 — Stokes Microvac Pump No. 149-F.

HIGH VACUUM GAGES

INDICATING AND RECORDING

Improved gages for portable use or permanent mounting. Fast, accurate readings in the micron range. Built-in trap eliminates condensable vapors to insure accurate readings.

This Stokes McLeod type gage, Flosdorf modification, is available in four models: No. 276-AA, 0 to 5,000 microns (5mm.); No. 276-BB, 0 to 500 microns; No. 276-C, 0 to 50 microns (recommended only for very high vacuum); No. 276-50, 0 to 50 mm.

Recommended for continuous visible record is the new Vacorder gage for high vacuum conditions in any of the above ranges, between 1 and 5,000 microns.

Send for Gage Bulletin No. 45G.

Fig. 5 — Tilting type McLeod Gage, Flosdorf modification. Quick reading. Accurate. Model 276-AA, 0 to 5,000 microns.

VACUUM STILLS

Fig. 6 — Laboratory type L, 10 gal. vacuum still. Equipped with product sampler and entrainment separator. Full range of sizes available in stainless steel, monel or nickel.

ROTARY VACUUM DRYER

Fig. 7 — Laboratory Type Rotary Vacuum Dryer, 15" dia. x 20" long. Various sizes in stainless steel, nickel, other metals.

5

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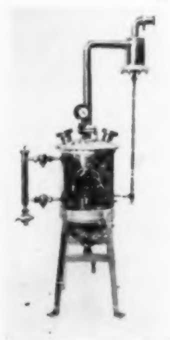

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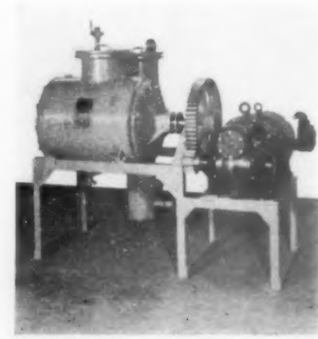

Pharmaceutical Laboratory Equipment

Stokes Tablet Machines and auxiliaries for medicinal tablet manufacture are standard equipment in pharmaceutical laboratories the world over. This wide acceptance of Stokes pharmaceutical equipment stems from its clean design and rugged construction, in combination with few and simple adjustments. Fifty years of experience in designing and building pharmaceutical manufacturing and laboratory equipment assures complete satisfaction. Similar practical equipment is available in capacities for teaching, research and experimental purposes, including Tablet Presses, Drug Mills, Mixers, Granulators, Drying Ovens, Coating and Polishing Pans.

Fig. 8 – Complete semi-plant-scale laboratory in college of pharmacy. Includes Coating and Polishing Pans, Tablet Press, Drug Mill, Drying Closet, Mixers, Ointment Mill.

Fig. 9 – Granulating Mixer, Model 21-AA. Available in Model AA, Capacity 25 lbs.; Model A, 50 lbs.; Model B, 100 lbs.; Model C, 200 lbs.

Fig. 10 – Laboratory-size Drying Closet. Electrically-heated forced circulation drying closet for drying pharmaceutical granulations, effervescent salts, etc. Laboratory size contains five 36" x 28" trays, model 38 has sixteen 35" x 28" trays.

Fig. 11 – Bench Type Coating Pan. Other sizes available in 16", 18", 24" and 30" dia., with interchangeable polishing head. Copper, stainless steel, or chrome plated.

Fig. 12 – Oscillating Granulator No. 43-A. Makes uniform granulations. Cast iron or stainless steel.

Fig. 13 – Drug Mill No. 64-B. For grinding dried tablet masses, chemicals, crystals, etc. Stainless steel model also available.

Fig. 14 – Eureka Tablet Machine. Produces tablets of highest quality and appearance up to ⅜" dia., output up to 100 tablets per minute. Hand-operated and motor-driven models. Three sets of round punches and dies furnished with each machine.

In addition to its use in tabletting pharmaceuticals, this Eureka Tablet Machine is also used for compressing chemicals, making experimental batches of catalytic tablets, making plastic products and powder metal test compacts.

STOKES CATALOGS

High Vacuum Pumps. Bulletin 463

High Vacuum Gages. Bulletin 45-G.

Processing Equipment. Laboratory and Industrial types, atmospheric and vacuum. See your current Chemical Engineering Catalog or write us.

Pharmaceutical Equipment. Includes Laboratory as well as Industrial Tablet Machines and Auxiliary Equipment, Catalog 480-T.

Water Stills. Laboratory types, steam, electric and gas heated. Up to 100 gph. capacity. Catalog 41-S.

Tube, Can and Jar Filling Machines. For filling, closing and sealing collapsible tubes. Filling jars and cans. Cat. 908-A.

Freeze-Drying Equipment. For drying by sublimation from the frozen state –penicillin and other biologicals, pharmaceuticals, chemicals, chemotherapeutics, foods, extracts, fruit juices, etc. Industrial types, Catalog 455-A. Laboratory types, Catalog 422.

Available also, book "Manufacture of Compressed Tablets" – only complete treatise on this subject. English and Spanish editions. 20 pages of formulas included. List price $3.00. Free of charge to schools and colleges.

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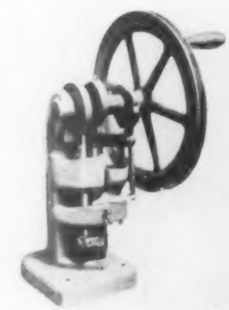

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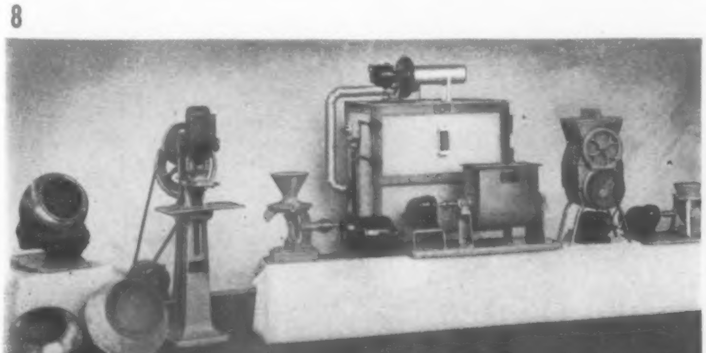

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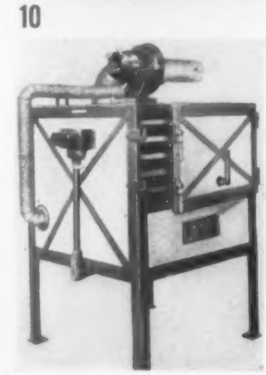

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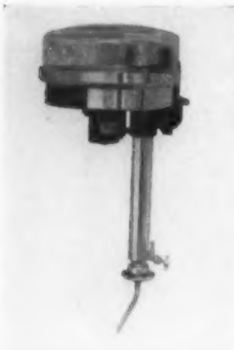

PURE WATER...by Distillation

With a Stokes Water Still you can produce, dependably and economically, the chemically and bacteriologically pure distilled water required for all laboratory purposes . . . pyrogen-free water of exceptional purity, above U.S.P. requirements.

These stills are automatic in operation, simple, rugged and easy to clean. They operate on a counter-current principle, the heat of steam generated in the boiling chamber being utilized to preheat the raw feed water. This method makes maximum use of the heat supplied to the still.

Design and construction of these stills protect the purity of distillate by removing dissolved gases from feed water, eliminating entrainment by triple baffling, and continuously removing impurities. An adequate stored supply of distilled water can be assured by specifying Automatic Controls, which start, stop, and flush the still without supervision.

For further details, send for Catalog No. 41-S.

Fig. 15 – Model 171-E, heavy duty, electrically heated, capacity 1 gal. per hour.

Model	Capacity U. S. gph	Type Element	K W. Rating	Elec. Current Spec.*
171 H	½	Standard	2 k.w.	A.C. or D.C. 115 or 230 V.
171 J	1	Standard	3 k.w.	A.C. or D.C 115 or 230 V.
171 E	1	Heavy Duty	3 k.w.	A.C. 115 or 230 V.
171 L	1½	Standard	4½ k.w.	A.C. or D.C. 115 or 230 V.
171 F	1½	Heavy Duty	4½ k.w.	A.C. 230 or 440 V.

All 28″ high; 13″ boiling chamber dia.

*Specify voltage when ordering. Available also for current of special voltage or phase.

Model	Capacity U. S. gph	Method of Heating
171 G	1	Gas
171 K	1	Kerosene or Gasoline
171 S	¾ to 1½	Steam (15 lb. pressure)

Height 28″, Boiling Chamber Diameter 13″, all models. Specify type of gas and B.T.U. content.

16

Fig. 16 – Model 000E, electrically heated, capacity 9 gals. per hr.

Model	Capacity U. S. gph	Method of Heating
000 G	2½	Gas
000 S	2 to 4	Steam (30 lb. pressure)
000 E	3	Electric 9 k.w.
000 EL	3	Electric 9 k.w.*

No. 000 Models. Height 48″, Boiling Chamber Diameter 20″.

*With heavy-duty elements (for hard-water) and low-water cut-off.

When ordering specify electric voltage or type of gas and B.T.U. content.

17

Fig. 17 – Model 1-S, steam heated, capacity 5 to 6 gal. per hr.

Model	Capacity U. S. gph	Method of Heating
1 S	5 to 6	Steam
1 E	5	Electric 13 k.w.
1 EL	5	Electric 13 k.w.**

No. 1 Models. Height 39″, Boiling Chamber Diameter 20″.

**With automatic low-water cut-off only. When ordering specify electric voltage.

Fig. 18 – Model 5-S, steam heated, capacity 90 to 100 gal. per hr.

Model	Capacity U. S. gph	Method of Heating	Height	Diameter Boiling Chamber
2 S	8 to 12	Steam	44″	20″
3 S	20 to 30	Steam	69″	30″
4 S	50 to 60	Steam	78″	36″
5 S	90 to 100	Steam	82″	48″

Capacity depends on steam pressure; operating pressures are from 25 to 35 lbs.

Figs. 19, 20, 21 – Typical installations of Stokes Stills.

F. J. STOKES MACHINE CO.

5960 TABOR ROAD, PHILADELPHIA 20, PA.

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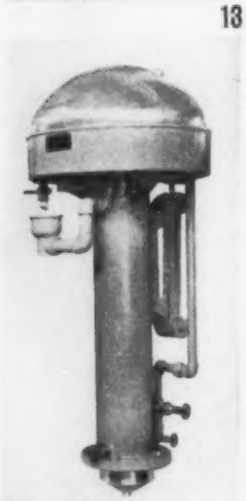

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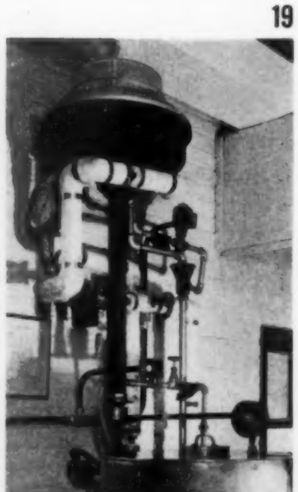

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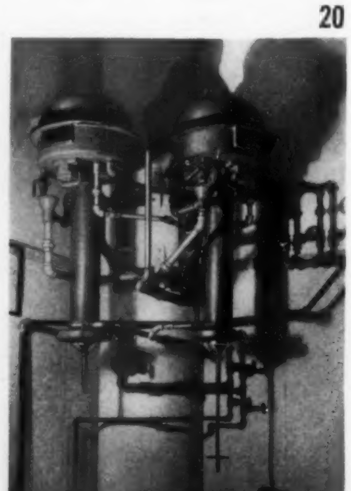

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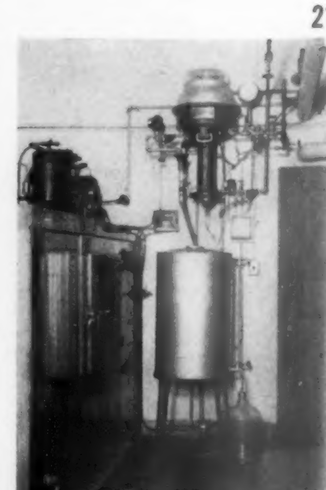

THE UNITED STATES STONEWARE CO.

Works (Since 1865): Akron, Ohio — NEW YORK OFFICE: 60 East 42nd Street

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ACID-PROOF CHEMICAL STONEWARE LABORATORY SINKS

"U. S. **Standard"** Acid-Proof Sinks are widely used in laboratories of universities, schools, hospitals and industrial companies.

The construction is **one-piece,** without seams or joints. The material is non-porous and non-absorbent. The corners are well-rounded and the surface smooth. Special sizes can be made to fit any desired space.

Glaze—Our "Hy-Gloss" salt glaze has a high lustre, dark brown finish and is an integral part of the body itself.

Guarantee—Our products are unconditionally guaranteed to be acid, alkali and corrosion-proof throughout the body, with or without the salt glaze. **We make all Laboratory Sinks of our special and exclusive "Ceratherm 500" heat-shock resistant body, thus enabling their use with boiling water, etc.**

Bulletin—Write for Bulletin No. 505 giving full information.

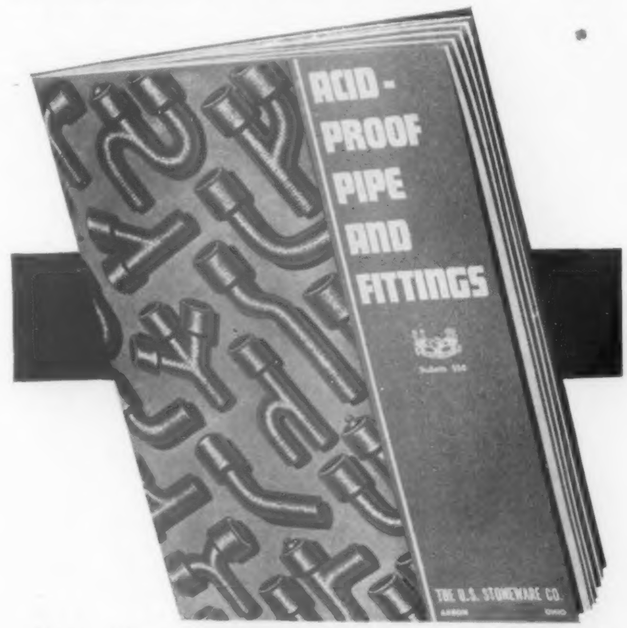
Other Products—Laboratory Table Troughs, Hemispherical Sinks, Sumps or Dilution Basins, Kjeldahl Equipment, Gas Generators, Laboratory Chlorine Cells, Suction Filters, Acid-proof Jars and Tanks, Burner Guards, Laboratory Jar Mills, Funnels, Exhaust Fans, "Tygon" Plastic Tubing, "Tygon" Corrosion-Resistant Paint, "Plastile" Floor Tile, etc.

ACID-PROOF PIPING

Our Acid-Proof Chemical Stoneware Pipe and Fittings are made of de-aired (vacuumized) clays. All pipe lengths are straight, even and round, thus facilitating erection. In the bell-and-spigot type, the hubs are all 4″ deep and both the spigot and hub ends are deeply corrugated. Every piece is accurately moulded and as true to dimensions as can be made by master-craftsmen highly skilled in the ceramic art. The joints may be sealed with our "CALKTITE" Acid-Proof Caulking Compound and on special order, we can furnish B&S Piping with our patented "TYLOX" Rubber Joints.

Would you like us to send you a copy of this new Bulletin No. 551 on Acid-Proof Piping just published by America's oldest and largest manufacturers of Acid-Proof Chemical Stoneware? It is the most complete and comprehensive treatise on this subject ever issued.

Nowhere else can you find such a wealth of engineering and technical data,—so much authoritative information on the most modern pipe caulking methods, installation technique, etc. Dimensional tables are complete for all standard fittings.



You will want to keep this new Bulletin handy for aid in the design and layout of piping installations, where corrosive solutions and gases are to be handled.

ACID-PROOF SINKS WITH INTEGRAL DRAINBOARDS

(One-piece)

Fig. 533-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 533-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 533-CSP (with Integral Nipple Outlet and Built-in Lute Trap).

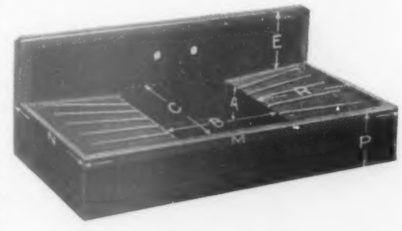
Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word
307	18	14	7	8	37½	16½	8⅞	18	197	Tong
312	20	16	7	10	39¾	19	9⅛	18	285	Tope
313-A	24	18	8	10	43¾	21	10⅛	18	348	Tory
315	30	20	8	10	49¾	23	10⅛	18	410	Tuch

Sinks are made with drainboards at right hand or left hand. Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral back and sinks without integral backs can also be supplied.

Fig. 536-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 536-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 536-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word
507	18	14	7	8	54	16½	8⅞	18	284	Trew
512	20	16	7	10	56	19	9⅛	18	402	Trig
513-A	24	18	8	10	60	21	10⅛	18	477	Trow
515	30	20	8	10	66	23	10⅛	18	546	Tude

Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral back and sinks without integral backs can also be supplied.

LEEDS & NORTHRUP COMPANY

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INSTRUMENTS FOR RESEARCH, TEACHING AND TESTING

The following L&N instruments are adapted, with a high degree of exactness, to the latest needs of the research scientist, of the student and of the man who makes routine tests in laboratory, plant or field. Usually, there will be found a choice of instruments and their accessories: for high or moderate precision; for table use or portable; for general use or specialized. In some, all components are self-contained. Others are separate units which can be combined to form various assemblies. Ask for:

Electrical Measuring Instruments for Research, Teaching and Testing .... Catalog E

One-Ohm Standard Resistor

Secondary-Standard Resistor

Enclosed-Switch Resistance Boxes

Unshielded A-C Resistance Box

Type HS Galvanometer

Jrl Ad EN-0441(1)

STANDARDS

For use as reference or working standards in d-c and a-c bridge measurements, we offer a wide choice of fixed and adjustable standards — resistors, inductors, capacitors — and standard (potential) cells. Because the properties of resistance materials, dielectrics, etc., are not invariable, and even the best standards are not absolute, a margin is allowed between accuracy of adjustment and that guaranteed. To assure reliability, only that accuracy is claimed which a given standard can be expected to maintain, in normal use, for a long period.

RESISTORS: Fixed resistors and adjustable resistance boxes—some primarily for d.c., others for a.c.

INDUCTORS: Fixed and adjustable, for use as standards of inductance in a-c bridge measurements up to 1000 cycles. Fixed inductors are toroidal coils, mounted on hard-rubber plates, enclosed in ventilated cases. Up to 1000 cycles, these inductors are practically immune from stray-field errors, cause no objectionable external fields, show no appreciable increase in resistance.

CAPACITORS: Mica and air capacitors are available in a choice of fixed and adjustable models.

STANDARD (POTENTIAL) CELLS: For use with potentiometers which require an external cell; each is supplied with a certificate issued by the Eppley Laboratories. For complete listings, see Catalog E.

GALVANOMETERS AND DYNAMOMETERS

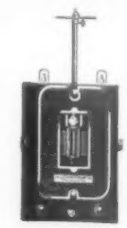
The L&N line includes d-c galvanometers, both moving coil and moving-magnet types; a-c galvanometers; and astatic dynamometers. Practically the entire range of applications for galvanometers and dynamometers is covered by our standard instruments. Among them, you can almost always find the one you need for use as a balance-point detector in potentiometer or bridge measurements, or for calibrated deflection measurements. Usually, the system is an easily interchangeable unit; one galvanometer with extra systems can be made to serve for a wide range of measurements.

D-C Moving-Coil Galvanometers are available in a variety of reflecting or pointer types. Reflecting galvanometers are supplied in models for use with detached scale, so either a telescope and scale or a lamp and scale can be used for reading deflections. Among these instruments are galvanometers especially designed for ballistic use. Reflecting galvanometers also are supplied with enclosed lamps and scales. Among these is a completely new Type E Galvanometer (pictured at right) which combines high sensitivity with an exceptionally short period. The Coblentz moving-magnet galvanometer is primarily for use with thermocouples in measuring radiant energy.

For use on 60-cycle circuits, a-c Moving-Coil Galvanometers are available in reflecting and pointer types. For measurements of voltage, current, and power, and for power factor by the phase-defect method, we offer three astatic dynamometers.

For a more complete discussion of galvanometer characteristics and an explanation of fundamental principles underlying the construction and use of the instruments, ask for a copy of our 48-page, pocket-size Note Book ED (1). ***Notes on Moving Coil Galvanometers.*** For a complete catalog, ask for:

Galvanometers and Dynamometers... Catalog ED

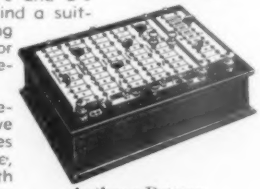


Type P Galvanometer

Type E Galvanometer

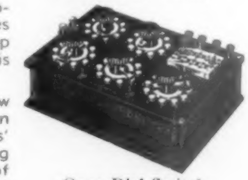
D-C AND A-C BRIDGES

For general measurements of resistance and impedance, and for a number of specific quantities which can be measured in terms of resistance or impedance, we build a varied line of d-c and a-c bridges. For many applications, you'll find a suitable, standard model . . . either among those for research, teaching and testing; or among our industrial-type indicators, recorders and controllers.



Anthony-Pattern Wheatstone Bridge

For high or moderate precision measurements of resistance above one ohm, we supply a variety of d-c Wheatstone Bridges —enclosed switch type, open switch type, and plug-type. For general use, both table and portable models are available. Among portables are the handy, compact Type U and Type S Test Sets for fault location. To locate faults in power cables at low voltages by the Murray Loop method, a Power Cable Fault Bridge is available.



Open-Dial-Switch Wheatstone Bridge

For low resistance measurements, below one ohm, Kelvin Bridges are supplied in table and portable models. The Students' Kelvin Bridge is widely used for teaching purposes. For rapid routine comparison of wire and rod samples with standards of same material, the Hoopes Conductivity Bridge is available.

Students' Kelvin Bridge

For extremely high-precision temperature measurements by the electrical resistance-thermometer method, the Type G-2 Mueller Bridge is supplied; Type G-1 Mueller Bridge is available for somewhat less precise measurements. We also offer several portable models.

Separate d-c ratio boxes and slidewires can be used in a variety of bridge assemblies.

To measure inductance, capacitance, resistance and related a-c quantities at commercial, audio and higher frequencies, we supply a varied line of reliable a-c bridges.

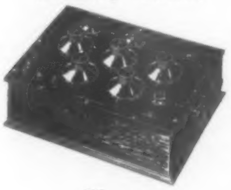
To determine concentrations of acid, alkaline and salt solutions, we offer a choice of general-purpose and specialized a-c Wheatstone bridges. For extremely pre-

Type U Test Set

Portable Conductivity Resistivity Indicator

cise measurements of electrolytic conductivity, the Jones Conductivity Bridge is usually recommended. Other equipments can be assembled from standard L&N instruments.

A Shielded Capacitance and Conductance Bridge is available for determining power factor. Various apparatus for testing dielectric properties and magnetic properties are supplied. Portable Frequency Indicators also are available. There is a wide choice of accessories for all d-c and a-c bridges. See Catalog E.



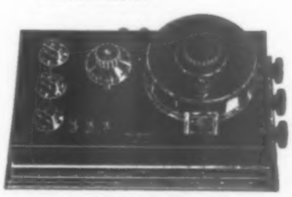
Wenner Potentiometer

POTENTIOMETERS

To determine emf as precisely as a given measurement demands, you can choose from a well-rounded line of L&N instruments, each of which applies the basically-sound potentiometer principle in a thoroughly reliable construction. Adjustments of slidewire uniformity, of resistor equality and of each potentiometer as a whole are made within conservatively safe limits. Each is a well-built, thoroughly-tested assembly on which the user can depend for full stability and reproducibility of measurements made within error limits which are definitely guaranteed.

Students' Potentiometer

For highly precise measurements of low voltages, primarily with thermocouples, the Wenner Thermocouple Potentiometer is recommended. Also available for precise measurements of temperature and temperature-difference are the White Potentiometers, Single and Double.



Type K-2 Potentiometer

For usual high-precision requirements, the Type K-2 Potentiometer, a three-range instrument, is recommended. It has an additional low range especially useful for thermocouple work, and for checking industrial potentiometer pyrometers. The Type K-1 Potentiometer can be supplied where a double-range precision potentiometer is needed for general lab use.

White Single Potentiometer

Where a simplified, moderate-precision potentiometer is needed for educational and general lab use, the Students' Potentiometer can be supplied.

Portable Millivolt Indicator

For usual on-the-spot checking of plant thermocouple pyrometers, several Portable Indicators are available. Handy to carry and calibrated in millivolts, they can be used with any type of couple.

For body-temperature measurements with hypodermic and skin-surface thermocouples, a Portable Millivolt and Temperature Indicator is available.

Portable Millivolt and Temp. Indicator

A compact, portable instrument which combines lab accuracy and sensitivity with speed and convenience is the Universal pH Indicator, direct-reading with its own self-contained glass electrode or with quinhydrone, hydrogen gas or any other widely used electrode. Other pH indicators also available.

For certain rapid-testing applications, the Brooks Deflection Potentiometer is used.

Volt boxes, shunts and other accessories are also supplied.

PHOTOMETERS

Bar photometer, generally used for measurements of highest precision; visual and photoelectric sphere photometers, with which spherical candlepower of a lamp can be determined in a single measurement; distribution photometer, for determining polar light flux distribution around large lamps and luminaires; Macbeth Illuminometer, compact, portable, for measuring illumination—described in:

Photometers .... **Catalog E-72**

PRIMARY ELEMENTS, ACCESSORIES, SUPPLIES

For various applications there is a wide choice of primary elements: for temperature—thermocouples and resistance thermometers; for pH—glass, quinhydrone, and hydrogen gas electrodes; for electrolytic conductivity—laboratory and industrial conductivity cells. Primary elements, accessories and supplies, are listed in Cat. E. See also:

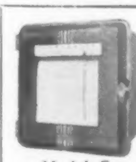
Thermocouples—Assemblies, Parts and Accessories ..... **Catalog NS2**
Keys and Switches .... **Catalog EU2**
Operating Supplies for L&N Equipments .... **Catalog ENT-W**

MISCELLANEOUS APPARATUS

Specialized measuring equipments facilitate certain routine tests: characteristics of magnetic materials; ratio and phase-angle of instrument transformers; specific inductive capacity and power factor of solid and liquid dielectric materials; insulation resistance; chemical analysis, using the dropping-mercury cathode method; and other tests. Described in Catalog E; further details in:

Silsbee Current Transformer Test Set .... **Bulletin E-50-501(1)**
Potential Transformer Test Set .... **Catalog E-50-501(2)**
Insulation Resistance Test Set .... **Catalog E-54-460(1)**
Modified Schering Bridge for Specific Inductive Capacity and Power Factor .... **Catalog E-54(2)**
Knorr-Albers Microphotometer .... **Catalog E-90(1)**
Electro Chemograph (Recording Equipment for Dropping Mercury Electrode Applications) .... **Bulletin E-94(1)**
Polarized Dropping Mercury Electrode .... **Bibliography E-94(1)**

MANY LABORATORY APPLICATIONS REQUIRE AUTOMATIC INSTRUMENTS



Model S Micromax or Speedomax

Model R Micromax

Model C Micromax

MICROMAX

Strip-Chart Model S records 1, 2, 3, 4, 5, 6, 8, 10, 12 or 16 points, in as many as 6 colors, on a wide, easily-read chart. Indicates on a straight scale. Supplied to measure temperature, pH, electrolytic conductivity, speed, or any one of numerous other quantities. Can operate signals, and simple or elaborate controls. For further details, see Catalog ND44(1).

Round-Chart Model R indicates temperature (or other quantity) with great clarity on a circular scale 28" in calibrated length. Draws a record on a convenient 24-hour circular chart. Can operate signals and simple or elaborate controls. See Catalog ND44(2) for details.

Non-Recording Model C is used where a controller need draw no record. Red pointer indicates control point; black one indicates operating temperature. Details are given in Catalog ND44 (3).

SPEEDOMAX TYPE A

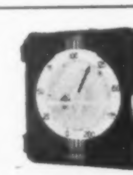
Speedomax Type A is used where temperature (or certain other conditions) should be recorded with exceptional speed . . . even faster than that provided by Speedomax Type G. Information on request.

SPEEDOMAX TYPE G

Strip-Chart Model S rapidly records one or as many as 16 unusually fast-changing temperatures. Can be supplied to operate signals, alarms and controls. See Catalog ND46 (1).

Round-Chart Model R clearly indicates an unusually fast-changing temperature and records on a circular chart. See Catalog ND46 (1).

Model D Indicator enables operator to read successive temperatures faster than ever before. For details, Catalog ND46 (1).



Model R Speedomax

Model D Speedomax Indicator

GENERAL RADIO COMPANY

275 Massachusetts Ave., Cambridge 39, Massachusetts

BRANCHES

New York Chicago Los Angeles

SINCE 1915 General Radio has pioneered in the design and manufacture of precision electrical laboratory measuring instruments for audio and radio frequencies. G-R instruments and accessories are in use in the principal educational, governmental and commercial laboratories throughout the world; G-R equipment is noted for its advanced design, modern engineering, careful manufacture and accurate calibration.

Here is a partial list of G-R products, all of which you should know more about:

BRIDGES—general purpose, capacitance, inductance, Twin-T impedance, radio-frequency, vacuum-tube characteristic, capacitance test, megohm, and cathode-ray bridge null detectors

LABORATORY STANDARDS—both fixed and variable standards of capacitance, inductance and resistance in a wide range of sizes and ratings

OSCILLATORS — general-purpose audio beat-frequency, wide-range audio-radio frequency, low-distortion audio, ultra-high radio frequency, pulse generator, v-t and microphone button-driven tuning forks, microphone hummer

AMPLIFIERS—a-c and d-c operated with high gain, wide frequency range and flat characteristics

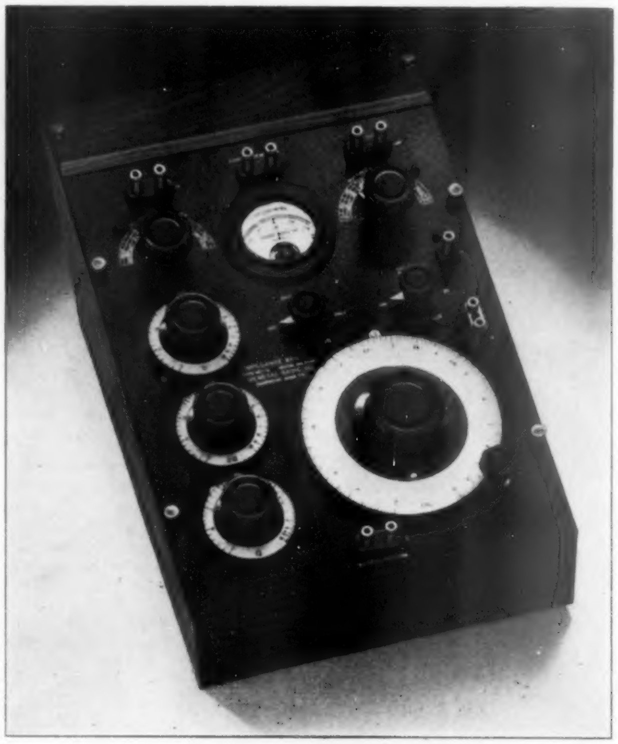
METERS—v-t and rectifier-type voltmeters, microvolter, megohmmeters, output-power meters

WAVEFORM MEASUREMENTS—wave analyzer, modulation and distortion meters, wave filters, high-speed moving film recorder

FREQUENCY MEASUREMENTS — standard-frequency assemblies, interpolation and auxiliary equipment, secondary frequency standards, piezo-electric oscillators, multivibrators, frequency deviation meters, frequency limit monitors, heterodyne frequency meters, quartz plates, precision tuning forks, precision and general-purpose wavemeters, synchronous clocks

INDUSTRIAL MEASUREMENTS — stroboscopes for motion observation and speed measurements, sound level meters and analyzers, vibration meters and analyzers

FOR COMPLETE INFORMATION WRITE FOR CATALOG "L"



This general-purpose impedance bridge is one of the most popular instruments in any laboratory. For routine measurements of inductance, capacitance and resistance it is always set-up and ready to operate. Completely self-contained, portable, and accurate enough for most routine measurements, it includes built-in standards, batteries, a 1,000-cycle tone source for a-c measurements, a zero-center galvanometer null indicator for d-c and terminals for a headset for a-c null detection.

With the Type 650-A Impedance Bridge you can measure these basic quantities over these very wide ranges:

INDUCTANCE: 1 microhenry to 100 henrys; CAPACITANCE: 1 micromicrofarad to 100 microfarads; RESISTANCE: 1 milliohm to 1 megohm; DISSIPATION FACTOR (R/X) from .002 to 1; STORAGE FACTOR (X/R): from .02 to 1,000.

TYPE 650-A IMPEDANCE BRIDGE: $240.00

MANUAL VOLTAGE CONTROLS—the VARIAC . . . the original continuously adjustable autotransformer for fine control of a-c voltages, made in a wide number of models and capacities

STANDARDIZED PARTS—switches, dials, knobs, plugs, jacks, coaxial terminals, binding posts, rheostats and potentiometers, fixed and variable condensers

WESTINGHOUSE ELECTRIC CORPORATION

Plants in 25 Cities — Offices Everywhere

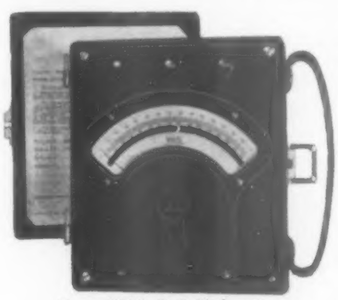
METER DIVISION • NEWARK, NEW JERSEY

A COMPLETE LINE OF INSTRUMENTS FOR LABORATORIES

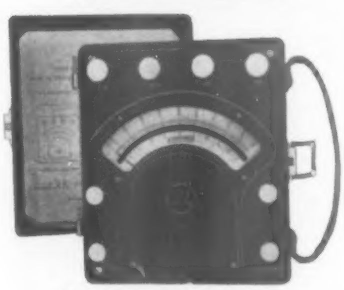
- **Portable Testing Instruments**
- **Switchboard and Panel Instruments**
- **Oscillographs and Recorders**
- **Auxiliary Equipment**

Westinghouse electrical instruments meet the exacting needs of university and college laboratories for scientific instruction . . . long life . . . accuracy . . . diversified application.

Illustrated and discussed here is a representative selection of electrical measuring instruments: portable, switchboard and panel types, recorders and oscillographs, shunts, resistors and portable transformers. For more detailed information and for recommended lists of instruments for various kinds of laboratories, call your nearest Westinghouse office or write for Booklet B-3664, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.



Type PX-5 D-C Voltmeter



Type PY-5 A-C Ammeter

PORTABLE INSTRUMENTS

TYPE P-5 LINE (Accuracy ½%)

The Type P-5 Series of Westinghouse instruments can withstand the severe portable service of constant laboratory use, and still maintain the highest degree of accuracy over long periods of time. The combination of high-grade mirrored dials and knife-edge pointers eliminates parallax and assures accurate reading. *Scale length is* 5 inches, and divisions are arranged to aid quick reading. Maximum versatility is achieved with multi-range scale, some of which incorporate seven ranges. Stray magnetic fields do not impair accuracy. *Movements* are mounted on moulded face plate for quick, easy dismantling for inspection and study in the classroom or laboratory. *Pre-aged Moldarta case* does not warp or deteriorate from age, hard service or weather conditions.

(For Complete Ordering Information, See Catalog Section 43-100)

FULL SCALE RANGE OF STANDARD RATINGS

TYPE PY-5 FOR ALTERNATING CURRENT		TYPE PX-5 FOR DIRECT CURRENT	
AMMETERS	0-.5 to 0-500	AMMETERS	0-.05 to 0-50
MILLIAMMETERS	0-10 to 0-750	MILLIAMMETERS	0-.03 to 3,000
VOLT-AMMETERS	0-75 to 0-750 volts 0-1 to 0-25 amps	MICROAMMETERS	0-10 to 0-750
VOLTMETERS	0-3 to 0-750	VOLT-AMMETERS	0-3 to 0-150 volts 0-.03 to 0-15 amps
WATTMETERS	0-20 to 0-25,000	MILLIVOLTMETERS	0-2 to 0-2,000
		VOLTMETERS	0-1 to 0-750

Type PX-4 D-C Double - range Voltmeter

TYPE P-4 LINE (Accuracy ¾%)

The Type P-4 Westinghouse line of portable instruments is designed for operating convenience. (Case measures only 4½" x 4½" x 2".) They may be easily dissembled for inspection and classroom instruction, and are well adapted for laboratory work. *Lightweight:* a-c instruments weight only 2 pounds; d-c instruments, 3 to 4 pounds. *Moldarta Case* is lightweight, non-warping, weather-resisting.

(For Complete Ordering Information, See Catalog Section 43-100)

Type PY-4 A-C Triple - range Voltmeter

FULL SCALE RANGE OF STANDARD RATINGS

TYPE PY-4 FOR ALTERNATING CURRENT	AMMETERS MILLIAMMETERS VOLTMETERS	0-1 to 0-50 0-5 to 0-750 0-1 to 0-750		
TYPE PX-4 FOR DIRECT CURRENT (Also Radio-frequency and Rectifier Types)	AMMETERS Radio frequency MILLIAMMETERS Radio frequency Rectifier type MICROAMMETERS Rectifier type	0-.25 to 0-300 0-.5 to 0-20 0-1 to 0-3,000 0-75 to 0-800 0-1.5 to 0-20 0-25 to 0-1,000 0-500	VOLTMETERS Rectifier type MILLIVOLTMETERS VOLT-AMMETERS	0-1 to 0-750 0-1 to 0-150 0-2 to 0-100 0-1.5 to 0-60 volts 0-.25 to 0-60 amperes

Type PX-14 open-face model. A separate binding post is provided for each range of a multi-range scale

Hinged cover, optional on either PX-14 or PA-14 models, assures full protection

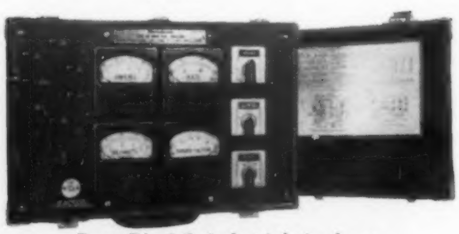
TYPE P-14 LINE (Accuracy 1%)

The Type P-14 portable instrument includes the features of the larger portables, plus the added advantages of extremely light weight and smaller overall dimensions. Its accuracy, versatility and low cost make it ideal for field and radio testing, and for general student laboratory work. *Maximum Versatility:* Up to 8 voltage ranges or 6 current ranges available with multi-range scales. Combinations such as four current and three voltage ranges in the same instrument make this one of the most versatile instruments available. *Maximum Portability:* Measuring only 5 3/16" x 4¼" x 2 9/16", both the hinged cover type and the open-top model are small enough to fit a pocket. *High Overload Capacity:* Type P-14 instruments will withstand exceptionally high overload shocks.

(For Complete Ordering Information, See Catalog Section 43-100)

FULL SCALE RANGE OF STANDARD RATINGS			
TYPE PA-14 FOR ALTERNATING CURRENT		TYPE PX-14 FOR DIRECT CURRENT	
VOLTMETERS	0-1.5 to 0-750	VOLTMETERS	0-.3 to 0-1,000
AMMETERS	0-.5 to 0-50	MILLIVOLTMETERS	0-10 to 0-1,000
MILLIAMMETERS	0-5 to 0-1,000	AMMETERS	0-.05 to 0-100
		MILLIAMMETERS	0-1 to 0-1,000
		MICROAMMETERS	0-25 to 0-1,000

ANALYZERS

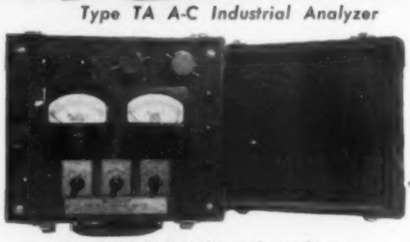


Type TA A-C Industrial Analyzer

TYPE TA—FOR A-C CIRCUITS (Accuracy: ammeter, voltmeter, 1%; wattmeter, 2%) Measures Volts, Amperes, Watts and Power Factor

The Westinghouse Type TA Industrial Analyzer incorporates in one compact, portable case all instruments necessary to obtain complete operating data of alternating current circuits up to 600 volts, 125 amperes. It is self-contained, eliminating need for carrying individual instruments and accessories to the job. Wiring set-up consists of simply connecting to power circuit and to the apparatus under test. Switches permit shifting ammeter and voltmeter to check all lines of a three-phase circuit under load. Instruments are placed close together to permit accurate, almost simultaneous readings.

(For Complete Ordering Information, See Catalog Section 43-100)



Type TX D-C Industrial Analyzer

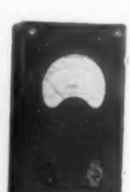
TYPE TX—FOR D-C CIRCUITS (Accuracy: voltmeter and ammeter, 1%)

Measures Volts, Amperes and Ohms

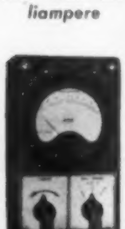
The Type TX Analyzer obtains complete running performance data of d-c motors, generators and controls without the necessity of setting up individual instruments, multipliers and shunts. Great volumes of wiring for test set-ups is eliminated, making the instrument most practicable for laboratory work. Simultaneous reading of various quantities may be more accurately obtained by the compact arrangement of the instruments. Tests d-c motors up to 600 hp, 750 volts, 750 amps.

(For Complete Ordering Information, See Catalog Section 43-146)

Type PM-32 d-c volt - ohm - milliampere



Type PX-25 double-range ohmmeter



Type PX-25 triple - range ohmmeter

Type PX-26 d-c volt-ohmmeter

TYPE PM AND PX TEST SETS

Units for Measuring Volts, Ohms and Milliamperes, Both A-C and D-C

Westinghouse portable test sets cover a broad field of application and meet many diverse requirements in general testing, laboratory and radio work. Although handy-size, these units combine maximum accuracy with maximum flexibility of application. They are used for testing circuit continuity, measuring circuits, insulation resistance and locating faults in electrical apparatus, communications, control and signal circuits.

(For Complete Ordering Information, See Catalog Section 43-100)

FULL SCALE RANGE OF STANDARD RATINGS			
VOLT-OHMMETER	0-1,000 to 0-1,000,000 ohms 0-5 to 0-500 volts D-C	OHMMETER	0-10 to 0-1,000,000 ohms
		A-C—D-C TEST	0-1,000 to 0-1,000,000 ohms
D-C TEST UNIT	0-200 to 0-10,000,000 ohms 0-2.5 to 1,000 volts D-C 0-1 to 0-100 milliamperes D-C	UNIT	0-1.5 to 0-750 volts D-C 15 to 750 volts A-C 0-1.5 to 0-150 milliamperes D-C

Type K-24 circular scale d-c voltmeter

Type UX-25 projection-mounted voltmeter

SWITCHBOARD INSTRUMENTS

24-LINE (Accuracy 1%)

4½" Class—Circular Scale, Rectangular Front—Round-body Case for Flush Mounting. Because of its extra-long scale, the 24-Line instrument combines high readability with minimum panel space requirements, particularly useful where panel area is at a premium. The pointer travel gives a scale length more than twice as long as other types which require the same panel space.

25-LINE (Accuracy 1%)

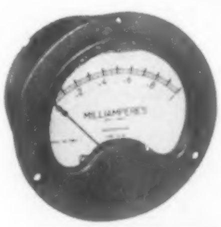
6" Class—Rectangular Case—Flush or Projection Mounting—Optional Internal Illumination. Westinghouse 25-Line instruments meet the requirements of many special installations. Simplicity of design, uniform appearance, interchangeability and availabilty of movements for any measurements, make this instrument especially suited for modernization as well as for new installations. All terminals are mounted near the vertical center line, permitting instruments to be mounted near the edge of a panel without interfering with supporting posts and wiring channels.

(For Complete Ordering Information, See Catalog Section 43-200)

FULL SCALE RANGE OF STANDARD RATINGS—24 and 25 Lines

DIRECT CURRENT	ALTERNATING CURRENT
Ammeters—0-1 to 0-60 (self-contained)	Ammeters—0-1 to 0-60 (self-contained)
Ammeters for use with shunts—0-50 or 0-100 millivolts	Ammeters for use with transformers—0-5
Voltmeters (24 line)—0-150 to 0-750 (self-contained) (25 line)—0-1 to 0-800 (self-contained)	Voltmeters (24 line)—0-150 to 0-750 (self-contained) (25 line)—0-50 to 0-750 (self-contained)
Milliammeters—0-.5 to 0-500	Voltmeters for use with transformers—150
Wattmeters—120 or 240, 0-50 or 0-100 millivolts for external shunts. (25 line only)	Wattmeters for use with transformers—5 amperes—120 volts
	Synchroscopes—120 volts
	Power Factor meters—5 amperes, 120 volts, 0-1-0 scale
	Frequency meters—(24 line)—120 volts, 60 cycles (25 line)—25 or 60 cycles

Type N - 33, flush-mounting, wide flange



Type NX-35, flush mounting

MINIATURE PANEL INSTRUMENTS

33-LINE (Accuracy 2%)

2½" Class—Scale Lengths, 1.5" to 1.8". Five flush mounting types of cases are available: the American War Standard; the round, wide-flange instrument; the round, narrow-flange type; the rectangular type. Projection mounted instruments also are available in round case. Cases are interchangeable.

35-LINE (Accuracy 2%)

3½" Class—Scale Lengths, 2.06" to 2.4". Available as a complete line in five types of cases and mounting covering all laboratory, industry and radio applications. The ratings cover the broadest field consistent with prevailing requirements for instruments of this class. Cases are interchangeable without adapters.

37-LINE (Accuracy 2%)

4½" Class—Scale Lengths, 2.9" to 3.2". The largest of the miniature panel instruments. The self-contained ratings cover the broadest possible field for this class of instruments. Higher ratings may be obtained by using external resistors, shunts or transformers. Five types of cases are interchangeable throughout the line.

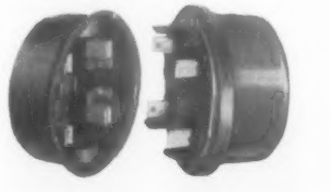
(For Complete Ordering Information, See Catalog Section 43-300)

Type N-37, flush mounting

FULL SCALE RANGE OF STANDARD RATINGS—TYPES 33-35-37

DIRECT CURRENT		MILLIAMMETERS	
AMMETERS	0-1 to 0-100	(For frequencies of 15 to 500 cycles)	0-5 to 0-500
MILLIAMMETERS	0-1 to 0-800	Rectifier	0-1 to 0-15
MICROAMMETERS	0-20 to 0-800	Radio Frequency	0-100 to 0-800
VOLTMETERS	0-1 to 0-1000	MICROAMMETERS	
MILLIVOLTMETERS	0-1 to 0-500	Rectifier	0-80 to 0-500
ALTERNATING CURRENT		VOLTMETERS	
AMMETERS		(For frequencies of 25 to 200 cycles)	0-1.5 to 0-1000
(For frequencies of 15 to 500 cycles)	0-1 to 0-50	Rectifier	0-.5 to 0-300
Radio Frequency	0-1 to 0-20	DB METERS	
		Rectifier	Standard Scales

Type E, showing simple but positive connection by plugs

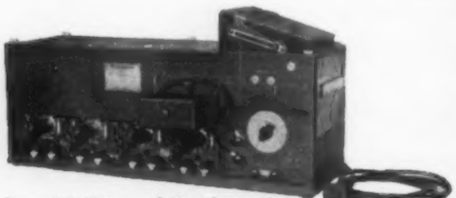


SOCKET INSTRUMENTS

6" CLASS—E-Line (Accuracy 1%)

Type E socket instruments provide a low cost means of checking load and machinery operation. One instrument can be used to check circuits at a number of places. Sockets may be mounted directly on conduits. After socket is installed, instruments may be plugged in or replaced quickly. Scale is 5¼", with bolt figures and target pointers to make reading easy at a distance. Temporary overloads do not harm the movements; no short-circuiting connections are necessary.

(For Complete Ordering Information, See Catalog Section 43-600)



Type PA Universal Oscillograph

Oscillograph mounted on mobile steel table for laboratory

TYPE PA UNIVERSAL OSCILLOGRAPH

The Westinghouse Oscillograph measures instantaneous electrical quantities visually, or photographically, or both simultaneously throughout a frequency range from zero or continuous quantity to 10,000 cycles per second. It is possible to view and record any one or all of the following quantities on one record . . . volts, millivolts, amperes, milliamperes, microamperes, polyphase or single-phase watts, frequencies up to 10,000 cycles.

There is one design of the main case. It is arranged to carry up to four control panels of a choice from seven and up to seven galvanometers of a choice from nineteen. These different types of film holders are available. This flexibility allows the interchanging of elements and panels to meet new requirements and does away with the necessity for completely different oscillographs to meet widely different needs.

Exacting developments and studies in electrical as well as mechanical equipment frequently require the use of the Westinghouse Oscillograph.

The main case is divided in two levels. The top level consists of the Oscillograph proper . . . optical system with the galvanometers. The lower level houses the controls for the galvanometers as well as the controls for the lamp filmholders and simultaneous viewing attachment. Filmholder, lamp and motor are mounted outside case.

(For Complete Ordering Information, See Catalog Section 43-510)

RECORDING INSTRUMENTS

TYPE G-40 DIRECT ACTING STRIP CHART RECORDER (Accuracy 1%)

Type G Recorder for Portable service

Perfection of detail in chart drive, chart reroll, chart threading and inking system, makes Type G-40 Recorders easier to operate and has removed many causes of lost records. Available for switchboard or portable applications.

The chart and clock mechanism are readily removable without disturbing the instrument movement or any connections to the instrument. Recording pen has a long-wearing, platinum-iridium point. Chart has double perforations for positive traction on driving drum. Accurate 8-day clock, or a synchronous motor clock, furnishes drive power for chart. Chart speeds of ¾″, 1½″, 3″ or 6″ per hour or per minute. An electronic-type recorder is also available in the G-40 line for the recording of low-energy values.

(For Complete Ordering Information, See Catalog Section 43-400)

TYPE A ROUND CHART RECORDER (Accuracy 2%)

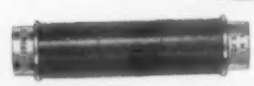
Type A Recorder for switchboard mounting

A low first-cost, low-maintenance recording instrument for a variety of applications where chart records of 2% accuracy are adequate for their purpose. Extra-sturdy construction makes this a convenient instrument for miscellaneous jobs. Portable, switchboard mounting, wall mounting or detachable socket-mounting cases are available. Scale length is 2 inches, but chart has suppressed zero scale with divisions comparable in size and readability to those of much longer scales. Charts are available for one-revolution-per-day or one-revolution-per-week operation. High-grade paper used makes charts stay flat.

(For Complete Ordering Information, See Catalog Section 43-400)

AUXILIARY EQUIPMENT

SECTIONAL TUBULAR RESISTORS FOR D-C INSTRUMENTS



Sectional tubular resistor

The sectional construction of these resistors permits a wide range of accurate measurements of high voltages with one milliampere instruments. Resistance values ¼, ½, ¾ or 1 megohm are standard, and combinations of these are used to form the complete unit. They are designed for panel mounting or portable use.

(For Complete Ordering Information, See Catalog Section 43-800)

TYPE G AND GG SHUNTS FOR D-C MEASUREMENT

Typical portable shunt

Type G and GG shunts provide a complete line for use with indicating or recording instruments for measuring direct currents beyond the range of self-contained instruments. Accuracy is maintained by special manganin alloy strips which are unaffected by temperature. Portable and switchboard types are available in 50 and 100 millivolt sizes with many different current ratings.

(For Complete Ordering Information, See Catalog Section 43-800)

PORTABLE POTENTIAL AND CURRENT TRANSFORMERS

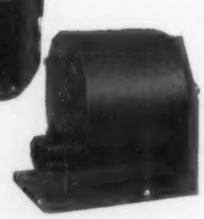
Type PC-137 current transformer

For measuring electrical quantities greater than the self-contained ranges for which the instruments are rated, these portable potential and current transformers offer a convenient and accurate means of increasing the usefulness of an instrument.

High overload capacity of multiple ratio current transformers permit safe use of continuous loads up to 200%. Potential transformers, available with three primary ratings, can be loaded safely up to several hundred percent.

(For Complete Ordering Information, See Catalog Section 43-800)

TYPE A-80 NONSPARKING A-C TACHOMETER



Type A-80 a-c tachometer with mounting bracket

Type A-80 tachometer combines an induction type generator and a rectifier indicating instrument. It has no commutator and no brushes, and with sealed-in type bearings which require no lubrication for life, practically eliminates maintenance.

(For Complete Ordering Information, See Catalog Section 43-800)

Weston Electrical Instrument Corporation

601 FRELINGHUYSEN AVENUE, NEWARK, N. J.

—WESTON INSTRUMENTS—

The Standard for

INSTRUCTION · RESEARCH · INDUSTRY

Weston Instruments are the accepted standard of dependable measurements in the research laboratory and throughout industry. As such they are essential in the school laboratory and shop.

Weston Instruments provide ruggedness, accuracy and long term dependability. Their use assures trouble-free results, thus fostering academic excellence. Students and instructors working with Weston instruments are equipped with the standards used in the field.

The models listed and described are particularly suitable for school use and can be furnished in all practical ranges. Information on the complete line sent promptly upon request.

PORTABLE AND PANEL INDICATING INSTRUMENTS—D.C. & A.C. TYPES

Microammeters, Milliammeters and Ammeters, Voltmeters, Wattmeters, Power Factor Meters, Frequency Meters, Galvanometers

LABORATORY STANDARDS

Voltmeters, Ammeters, Wattmeters

ACCESSORIES

Shunts, Resistors, Current and Potential Transformers, Standard Cells, Rectifiers, Thermocouples, *Photronic Cells

SERVICE INSTRUMENTS

A.C. Power Analyzer, Clamp Ammeter, Circuit Testers, Ohmmeters, Electronic Volt-Ohm-Milliammeter, Vacuum Tube Testers, Insulation Tester, Light Measuring Instruments

RELAYS

Sensitive (magnetic and non-magnetic contact). Power use. Current and Voltage types

PHOTOGRAPHIC EQUIPMENT

Exposure Meter, Photographic Analyzer

TEMPERATURE INDICATING INSTRUMENTS

Electrical Type—Remote indicating (Thermocouple and Resistance)
Bimetallic Type—Laboratory, Industrial

ELECTRIC TACHOMETERS (SPEED INDICATIONS)

A.C. & D.C. Types—Remote Indicating

*Photronic . . . A registered trade-mark designating the photo-electric cells and devices manufactured exclusively by the Weston Electrical Instrument Corporation.

ELECTRICAL WESTON INSTRUMENTS

Instruments for Every Classroom

Model 430

Portable AC and DC

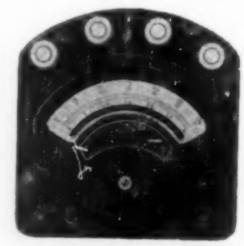
Voltmeters • Ammeters • Single Phase Wattmeters

Extensively used in technical schools and throughout industry for general test work, because they are extremely compact, and combine unusual ruggedness with dependable accuracy. The unusually large scale opening permits good visibility of the long hand calibrated mirror scales with knife edge pointers. Contained in molded Bakelite cases provided with leather carrying strap. Size approximately 5-1/16" x 6-1/32" x 3-1/2". Weight approximately 3-1/2 lbs.

Model 622

AC and DC Ultra-Sensitive Instruments

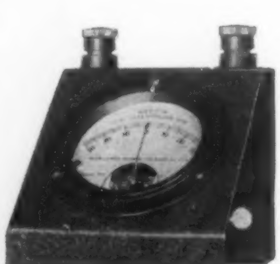
A group of high-sensitivity instruments requiring no leveling. Ideal for precision measurement of potentials and minute currents involving electronics, thermo-couples or laboratory research. Available as DC Voltmeters, Millivoltmeters, Milliammeters, Microammeters. Also AC Thermo Ammeters, Thermo Milliammeters, Thermo Voltmeters.



Model 280

Miniature DC Instruments

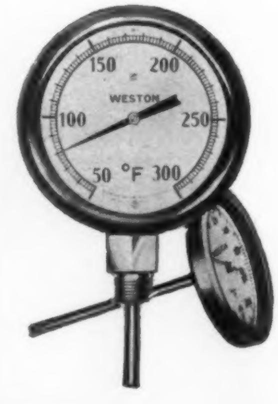
Available in single and multi-range, portable models which are most convenient for student use on a variety of testing. Features are: 1% accuracy, ruggedness, hand calibrated mirror scales, knife edge pointers and magnetic shielding. Size 4-2/5" x 4-3/5" x 1-1/2".



Model 375

Student Galvonometer

Made in two models, with or without mounting base. Widely used in school laboratories where dependability and low cost are first considerations. Sensitivity is 22 microamperes. Resistance 23 ohms. Models also available where medium or extreme sensitivity is required.



THERMOMETERS

Laboratory and Industrial Types

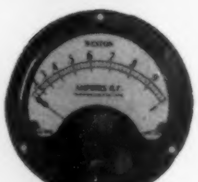
Weston all-metal temperature gauges have large gauge-type scales which provide extreme readability, even at a distance. The laboratory model is guaranteed accurate within ½ of 1% over full scale and the industrial types within 1% of full scale. As there are no fragile parts, accuracy is maintained over far longer periods and they withstand vibration and accidental breakage.

WESTON PANEL INSTRUMENTS

Design instructors will appreciate the wide selection of Weston panel instrument models. They will fill every requirement for attractive appearance, utility and dependable measurement.

Model 801 Group — Rectangular

Exceptional scale length, readability, and ease of mounting are the features of this general purpose group. Made in all types and ranges for practical AC and DC use. Cases are black, semi-flush Bakelite 4-1/4" x 3-15/16". Scale length 3.17".



Model 640 Group — Round

A line of AC and DC instruments available in all practical ranges. Standard case is 4-3/8" dia., flush Bakelite. Surface Bakelite and flush or surface metal cases are optional. Scale length 3.34".

Model 301 Group Round or Rectangular

A group of compact AC and DC panel instruments, measuring approximately 3-3/8" dia., available in all required types and ranges. Round shapes furnished with flush Bakelite cases. Rectangulars, flush or surface in either Bakelite or metal.

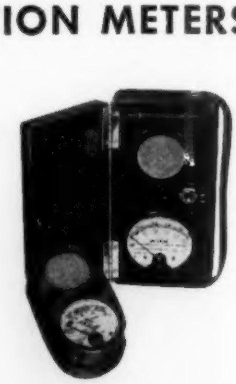
Model 269 Group — Fan Shape

A very attractive group of wide range DC instruments with the longest scales ever attained for comparable sizes. Accuracy 1%. Available in four scale lengths 2.6"—4"—5.8"—7.32"; and supplied in surface types, black finished steel cases.

WESTON ILLUMINATION METERS

Weston Illumination Meters

Model 703, pocket size and entirely self-contained. Measures directly in foot-candles, range 0-75 fc. Available with Viscor filter for measuring all types of lighting direct, regardless of color characteristics.



Model 614, has three ranges, available through range changing switch . . . 0-60/0—120/—0-600/foot candles. Also available with the Viscor filter as described above.

BRANCH OFFICES

NEW YORK 7—Weston Electrical Inst. Corp.......50 Church St.
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JACKSONVILLE 2—Ward Eng. Co., Inc....302 Hildebrandt Bldg.
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MERIDEN, CONN.—John S. Isdale................144 Curtis St.
MINNEAPOLIS 2—Geeseka & Pinkney...552-553 Plymouth Bldg.
NEWARK 5, N. J.—J. R. Hemion.........614 Frelinghuysen Ave.
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ORLANDO, FLA.—Ward Eng. Co., Inc....1217 West Central Ave.
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SAN FRANCISCO 11—Herman E. Held............420 Market St.
SEATTLE 4—Eicher & Company..............263 Colman Bldg.
ST. LOUIS 1—C. B. Fall Co........................317 N. 11th St.
SYRACUSE 2—Schiefer Elec. Co., Inc......204 State Tower Bldg.
TULSA 1, OKLA.—Riddle & Hubbell........302 S. Cheyenne Ave.
CALGARY, ALTA.—Northern Electric Co., Ltd.....102 11th Ave.
HALIFAX, N. S.—Northern Electric Co., Ltd..........86 Hollis St.
MONCTON, N. B.—Northern Electric Co., Ltd.......599 Main St.
MONTREAL, QUE.—Northern Elec. Co., Ltd. 1620 Notre Dame St. W.
MONTREAL, QUE.—Powerlite Devices, Ltd......807 Keefer Bldg.
OTTAWA, ONT.—Northern Electric Co., Ltd.......302 Sparks St.
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TORONTO, ONT.—Powerlite Devices, Ltd....1870 Davenport Rd.
TORONTO, ONT.—Northern Electric Co., Ltd......131 Simcoe St.
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BUFFALO 16—Electrical Instrument Labys......1487 Hertel Ave.
CHICAGO 10—Illinois Testing Labys.......420 No. La Salle St.
CLEVELAND 14—Christie Labys., Inc.....616 St. Clair Ave. N. E.
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DETROIT 26—Electrical Insp. & Serv. Co...508 United Artists Bldg.
KANSAS CITY 3—Boutros Instrument Laby.......1627 E. 31st St.
LOS ANGELES 16—W. R. Turner........4831 W. Jefferson Blvd.
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2904 South Avenue, Elmwood Station
MONTREAL, QUE.—Northern Elec. Co., Ltd. 1620 Notre Dame St. W.
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Weston Electrical Instrument Corporation

601 FRELINGHUYSEN AVENUE, NEWARK, N. J.

AMERICAN TYPE FOUNDERS SALES CORPORATION

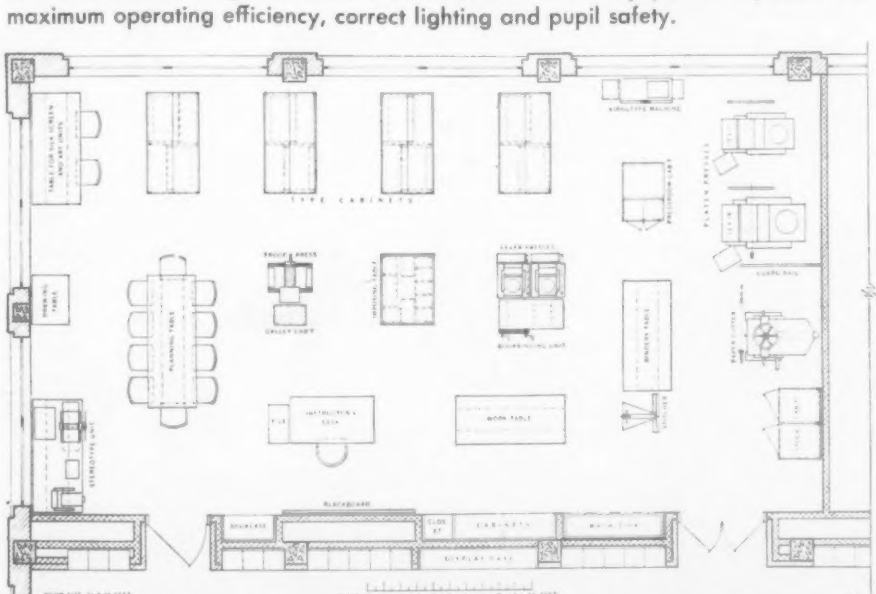
Department of Education **· 200 Elmora Avenue, Elizabeth B, New Jersey**

A Typical Planning Committee at Work

ATF Educational Planning Service...

for School Architects and Administrators

The ATF Department of Education has assisted School Architects and Administrators for over 30 years in the planning of Graphic Arts Departments. This specialized engineering service is available without obligation to school officials and architects who are preparing new school building plans. • In the preparation of all layouts, due consideration is given to the correct location of the equipment to provide for maximum operating efficiency, correct lighting and pupil safety.



A Typical ATF-Planned Graphic Arts Department

The following ideal room layouts complete with item specifications are available on request. Other special room layouts will be prepared when local conditions do not permit the use of these standard plans.

Junior High

6-J	6 to 10 pupils	528 sq. ft.
12-J	12 to 15 pupils	840 sq. ft.
15-J	15 to 19 pupils	960 sq. ft.
20-J	20 to 24 pupils	1080 sq. ft.
24-J	24 to 30 pupils	1200 sq. ft.

Senior High

6-S	6 to 10 pupils	598 sq. ft.
12-S	12 to 15 pupils	910 sq. ft.
15-S	15 to 20 pupils	1040 sq. ft.
20-S	20 to 25 pupils	1248 sq. ft.
24-S	24 to 30 pupils	1352 sq. ft.

Vocational

10-V	10 to 20 pupils	2240 sq. ft.
15-V	15 to 20 pupils (Includes Offset Department)	3840 sq. ft.
20-V	20 to 25 pupils	2968 sq. ft.
25-V	25 to 30 pupils (Includes Offset Department)	4736 sq. ft.

Teachers College

20-TC	15 to 25 students	1430 sq. ft.

Planning an Efficient Graphic Arts Department

Too little consideration is being given to the correct planning or room layout that will provide maximum efficiency in functional operation. We still find new junior and senior high school buildings being constructed with all the shops or laboratories grouped together out in a wing of the building. These shops, on the industrial arts level, are laboratories in which the so-called academic subjects are given purposeful application in a well-organized activity, and therefore they should be located throughout the building in their functional relation to these subjects.

For example, the printing or graphic arts department should be located close to the English and art rooms because English and art are fundamental factors in the production of printing projects. In other words, English and art are given purposeful creative values in their application to the work in the printing department.

Fig. 1

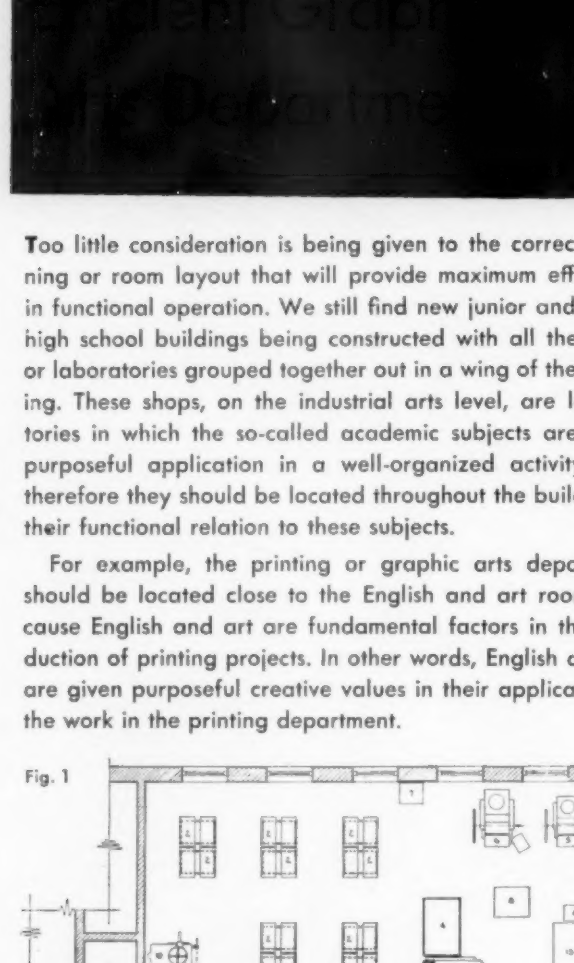
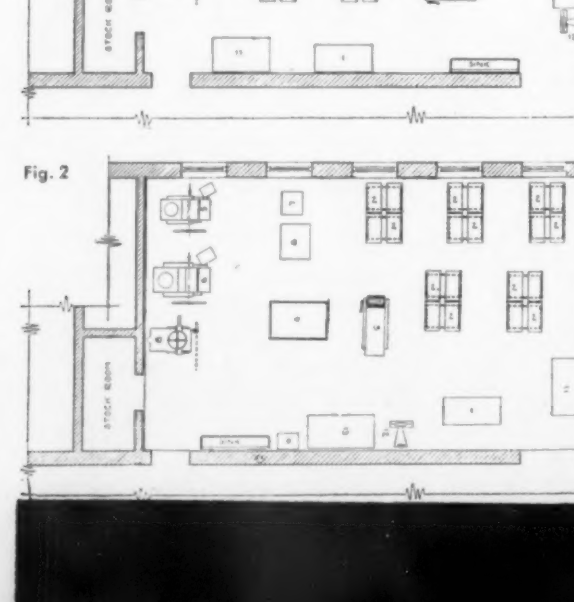


Fig. 2



In the preparation of a floor plan, whether it be for a graphic arts unit in a junior, senior, or vocational high school, there are certain fundamental factors to be considered. These factors are:

First, the routing of the material in the room. There exists a certain definite functional relationship between each item of equipment in the print shop, which determines its correct location and thus makes for efficiency in class organization and operation. This type of room layout will eliminate unnecessary travel and confusion and, incidentally, influences discipline through efficient organization.

Second, the natural lighting of the room. As far as possible, all equipment should be so located that the light from the windows will enter at the side of each pupil. In other words, the operator should not be facing the light and he should not be working in his own shadow.

Third, the safety problem. All machinery should be completely equipped with safety devices and should be so placed that the student or operator is not standing in a thoroughfare aisle where traffic may interfere with his work. The operator of a hand-fed press should not face the glaring light of a window. If the room is located on the first floor of the school, the lower half of the windows should be ground glass so that the pupils will not be distracted by outside happenings.

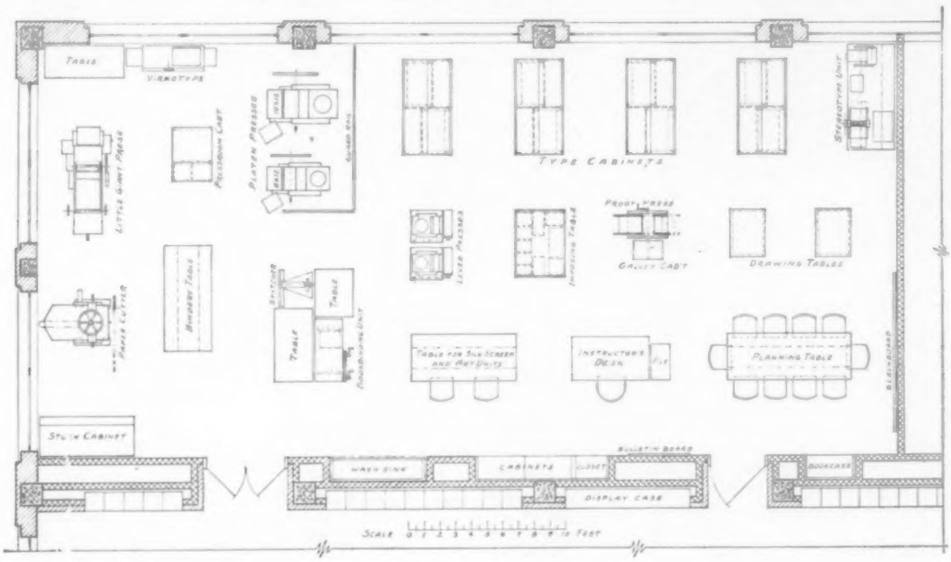
Illustration No. 1 is a good example of an inefficient, poorly planned floor layout. In other words, this illustrates the way it should not be done.

Note that in this layout the two hand-fed presses are placed so that the operators are facing directly into the light from the windows. These presses should be turned around so that the light will enter at the side of the pupils who operate them. Furthermore, note that these presses are located at the extreme end of the room, while diagonally across, at the other extreme end, are found the stock room and the cutter. This means that the paper stock is taken from the stock room, cut on the paper cutter, and then carried to the other extreme end of the room for printing on the presses. A correct floor plan would show these two presses (5 and 6) located at the other end of the room beside the paper cutter (10). A satisfactory rearrangement is shown in Illustration No. 2. This change in the location of the two platen presses near stockroom and paper cutter would necessitate relocating other items, such as the bindery equipment, to provide for natural routing of the printed material, thus increasing the operating efficiency.

In conclusion, our present-day concept of education for life and citizenship in an industrial civilization has given us a greatly expanded curriculum in which more and more emphasis is placed on the development of creative thinking and doing. This in turn calls for a new concept in school building design and room layouts.

A Teachers College Graphic Arts Layout

The increasing popularity of the graphic arts in junior and senior high schools, as a phase of the industrial arts in the general education program, necessitates the need for expanded teacher-training facilities. With the unit illustrated at left, teachers will be trained on the types of equipment commonly found in graphic arts departments in junior and senior high schools.

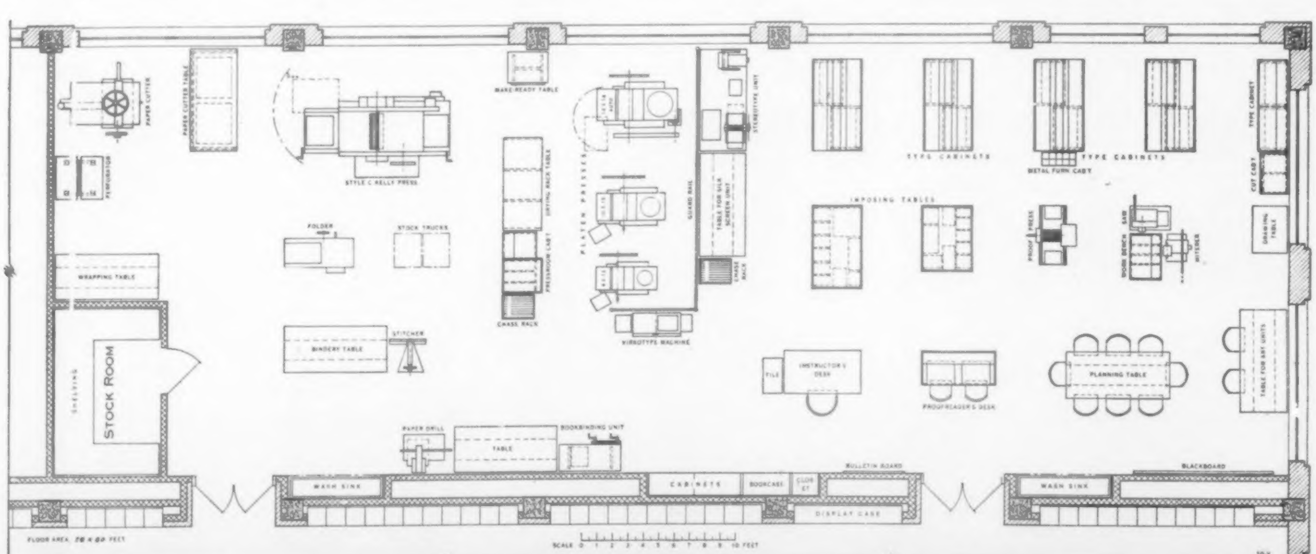


This layout shows an ideal arrangement of equipment especially selected to give teachers-in-training a broad variety of experiences and an understanding of the basic printing processes.

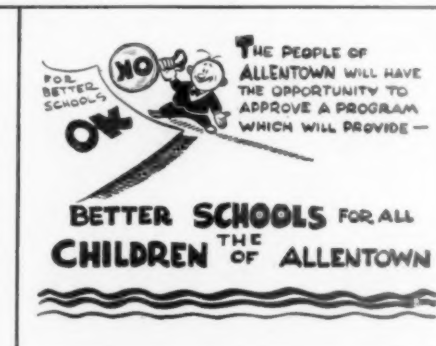
Blueprints and specifications of graphic arts departments for the above types of schools are available to administrators and architects on request.

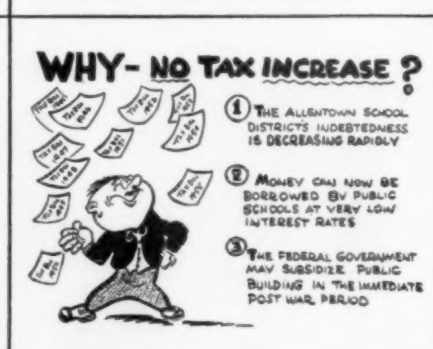
An Ideal Graphic Arts Layout for the Vocational School

The existing need for trained young men in the printing industry has become increasingly acute in recent years. The layout (below) is one of the series of vocational units planned to accomplish this objective. It is available on request. Note that the equipment shown in this layout is the same as that in a typical commercial printing plant.



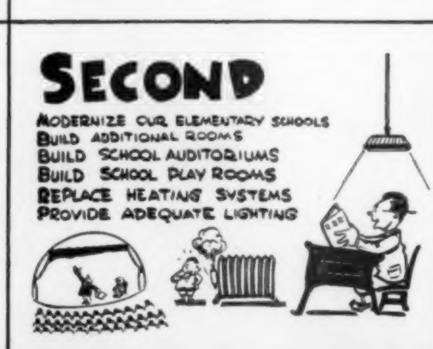
An intelligently directed publicity program is a valuable informative medium at the command of the school executive. It can be of tremendous assistance to him in winning support for his entire educational program, including the raising of funds for new buildings. It will also serve to interpret the aims and ideals of the school and its various departments and activities to the community; and for ultimately improving substantially the financial situation of the school system. A school printing plant makes such programs feasible. *The school printing laboratory is the ideal publicity medium—and it is under school control.* Printing is the most powerful publicity medium known to man.

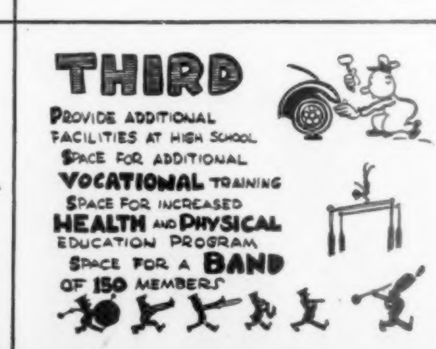




"...The use of printed material played a very significant part in reaching and making the public aware of the needs and issues involved in the campaign. The cartoon bulletin 'For Allentown's Children' obtained a very wide interest in the campaign and was without a doubt a vital factor in its success..."

Fred W. Hosler,
Superintendent of Schools





GENERAL ELECTRIC COMPANY

EDUCATIONAL SERVICE DIVISION

1 River Road, Schenectady 5, N. Y.

HOW YOU CAN GET EDUCATIONAL SERVICE

We are pleased to offer you — our friends in the Teaching Profession — the facilities of our engineers, our factories, and our laboratories for assistance in laying out your school laboratory, in selecting the proper equipment, and in obtaining General Electric technical literature for educational purposes.

To improve this service, we have organized groups within the Company in each of our operating departments and laboratories which specialize in educational problems. Representatives of these departments are located in many cities throughout the country, and are supervised by a specialist whom we designate as our educational authority. To obtain prompt service, your request should be addressed to one of the following:

Location	Address	Authority
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Butte, Montana	20 West Granite Street	C. A. Champ
Chicago 80, Illinois	840 South Canal Street	E. G. Abbott, H. D. Sanborn
Cleveland 4, Ohio	4966 Woodland Avenue	R. C. Hardy
Dallas 2, Texas	1801 North Lamar Street	R. T. Shiels
Denver 2, Colorado	650 Seventeenth Street	A. S. Anderson
Los Angeles 54, Calif.	212 North Vignes Street	S. W. Scarfe
New York 22, New York	570 Lexington Avenue	F. A. Faron
Philadelphia 2, Pa.	1405 Locust Street	R. H. Rensch
Salt Lake City 9, Utah	200 South Main Street	B. C. J. Wheatlake
San Francisco 6, Calif.	235 Montgomery Street	R. O. Brosemer
Seattle 11, Washington	710 Second Avenue	L. B. Robinson

Advisory Service

The General Electric Company has many training programs for apprentices as well as post-graduate courses. Suggested laboratory layouts are made under the supervision of experienced educators and the equipment recommended is based on actual educational practice. There is no charge for this advisory service.

Laboratory and Shop Equipment Specifications Bulletin GED-1093

This publication is widely used by educators in selecting equipment for the electrical shop or laboratory. It describes the material which may be used in the layout illustrated or in one especially designed to meet your problems. An electronics laboratory section is included. Modern metal-enclosed switchboards, in accordance with the latest industrial practice, are recommended.

The bulletin includes suggestions for the basic material needed for a first-class technical high school, technical institute or as a basic list for an engineering college. This is termed the "Group A" equipment.

An intermediate group known as "B" equipment will provide the minimum material for a technical institute and is sufficient for high grade technical high schools.

Group "C" equipment is the minimum suggested for a school planning technical courses but not able to have a complete laboratory initially. In most cases, this list will meet the minimum requirements for state approved technical high schools in small communities. Additional items required can be purchased as the class progresses. Physics laboratories are included.

Layouts

Although typical layouts are included in Bulletin GED-1093, special situations involving floor space and local conditions frequently necessitate making special plans. Those desiring to take advantage of this service should give the following information, so that recommendations will meet adequately all requirements:

1. Is the school to offer technical, vocational, or industrial art courses?

2. Is it a day or evening school?

3. What is the length of course in years, days per week, and hours per day?

4. What is the average number of students who will be using the laboratory at one time?

5. Will the school be held in a new or old building?

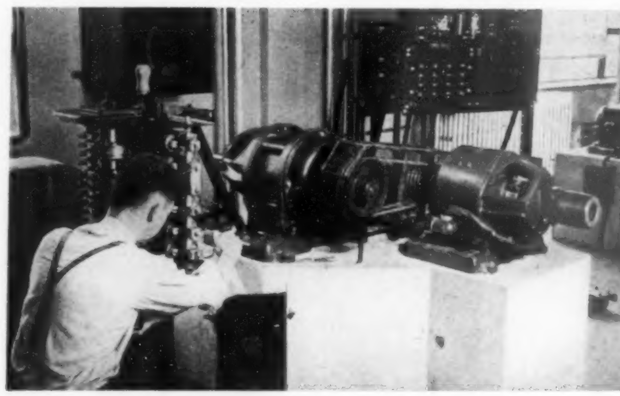
6. What type of floors will be used, and will the laboratory be on the ground floor or above?

7. Include a simple floor plan of the room available and indicate a scale of size of windows, doors, partitions, columns, etc.

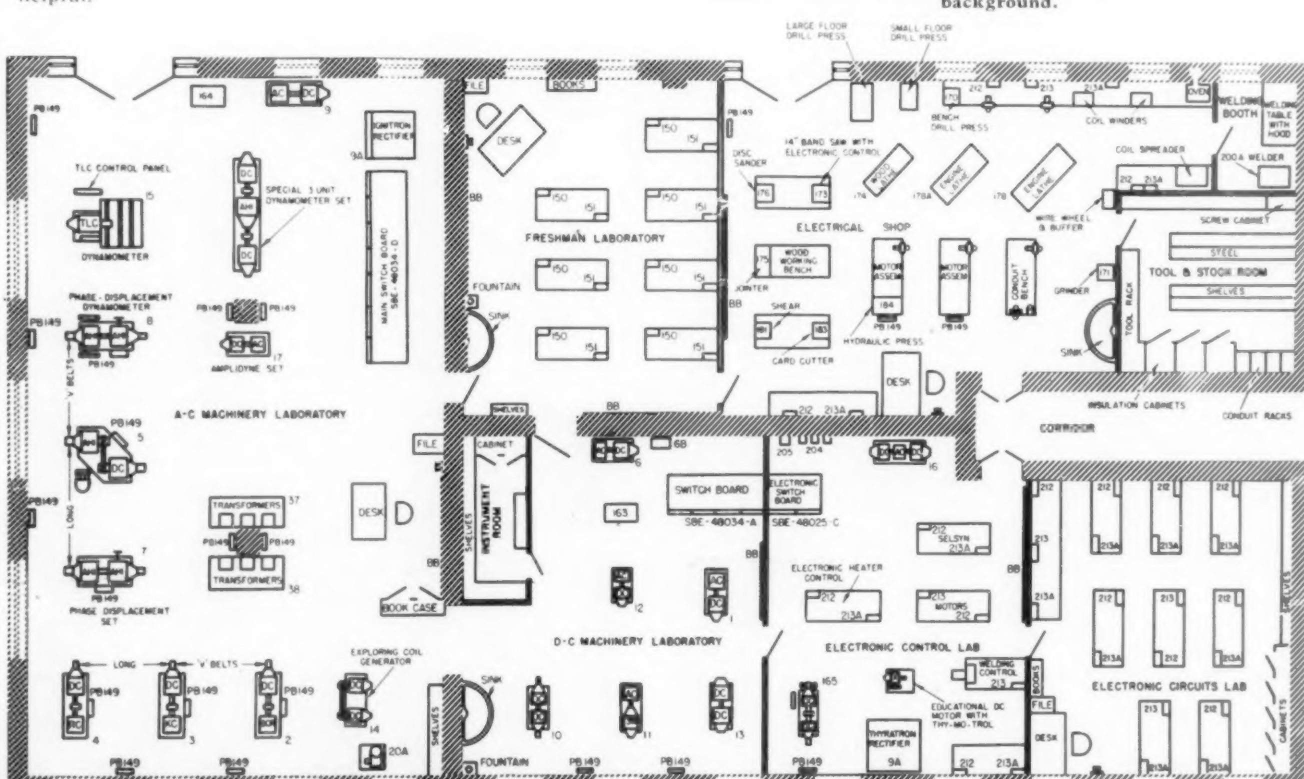
8. What power supply is available, and where is it located with reference to each room?

When new construction is possible, consideration should be given to the use of Q-Floor wiring as described in the Data Manual 18-136. Copies are available on request. The Q-Floor is a cellular steel floor which combines great strength and light weight of steel with considerable economy and advantage to the building owner. Because of the solid steel construction this floor becomes an ideal series of raceways for electric wiring. These raceways provide 100 per cent availability for the electric system to keep the buildings electrically modern for years.

For old buildings, necessitating the use of ducts, the publication "G-E Fiber Duct Catalog" No. 53-212-1 will be helpful.



The drum controller provides a ready means of speed control on this belt-driven motor-generator set. Convenient terminals facilitate connections. An a-c control panel is shown in the background.



The numbers refer to equipment as listed in Catalog GED-1093. Q-Floor construction and G-E electric distribution system recommended

Laboratory Switchboard and Power Distribution

General Electric's new educational switchboard is thoroughly modern, thus enabling students to work with the very latest designs of circuit breakers, instrumentation, and metal-enclosed switchgear. This construction affords the maximum of safety to the students in their work, and at the same time, by means of hinged front panels, drawout air circuit breakers, hinged rear doors and interior illumination provide the complete accessibility so essential for instructional purposes.

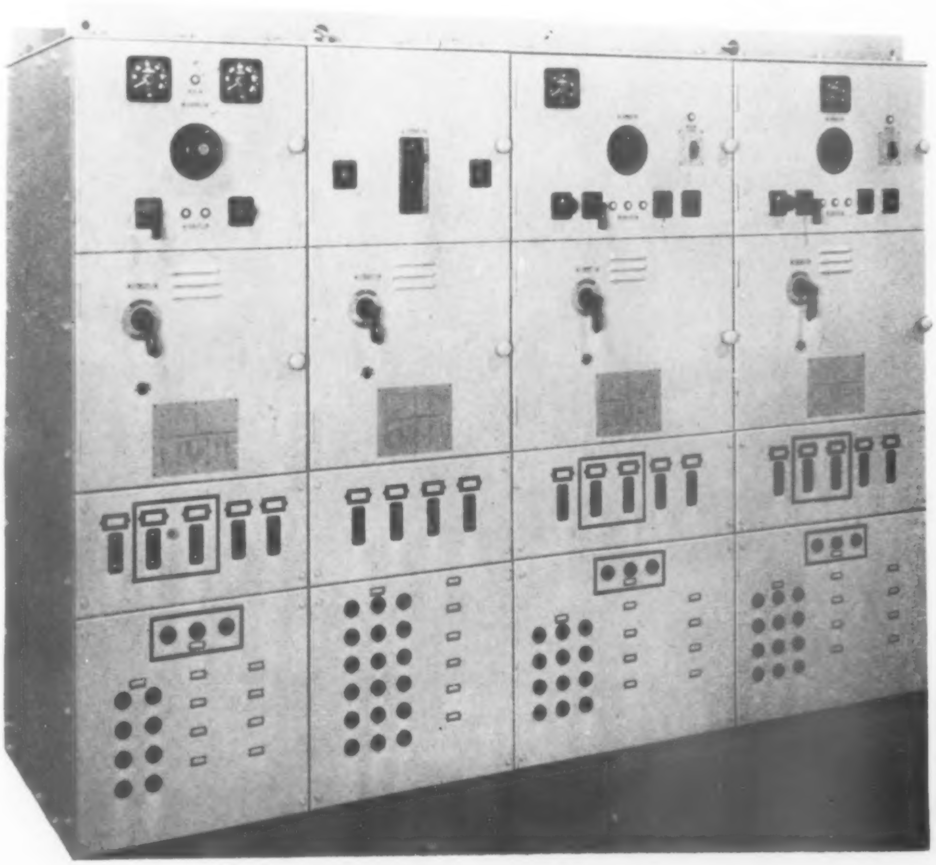
The board is designed in unit panel assembly and any combination of units may be selected to meet local conditions. Facilities may be expanded by the purchase of additional units as more funds become available.

For equivalent circuit facilities, the new board requires only about two-thirds of the floor area taken by conventional dead-front boards.

Adequate distribution facilities from the switchboard to the laboratory should be given careful study. For this purpose, General Electric plug-switch panels can be placed at advantageous points in the laboratory to facilitate the interconnection of various machines to the required main switchboard panels. These plug-switch panels are an essential part of the distribution system.

Smaller test-table outlet boxes have also been designed for use in Electronics and Physics Laboratories, to interconnect lighter apparatus with the main switchboard.

In this illustration, the d-c unit shown is used to provide load for an a-c motor. The required change in connections is made quickly by means of the spring terminals.



Literature

In addition to the booklets previously mentioned, many others are available with information which will be of assistance in teaching, or descriptive of material that may be useful in the laboratory. In addition to the well known types of a-c and d-c motors and generators, control equipment, transformers, wire and cable, etc., the following items, described briefly, may be suggestive of applications in the laboratory or classroom.

Lamp Department

Instruction in Illumination is the Growing Demand

Progress in this field now provides opportunity for stimulating interest in laboratory work. Beyond the continuing need for photometric equipment, lamps, fixtures, candlemeters, the modern illumination laboratory should be equipped for the emphasis and measurement of brightness, brightness contrast, and the quality as well as the quantity of illumination.

The experience of the General Electric Company in developing equipment and facilities for demonstration and laboratory work in all fields of lighting, as well as in lighting fundamentals, is available to educators on request.

Among a number of light-measuring instruments of proved quality, the following are important laboratory items:

G-E Light-sensitive Cell, "GEA-2467"
G-E Light Meter
Baumgartner Reflectometer
Luckiesh-Taylor Brightness Meter

For larger groups than the G-E light meter can service, a readily portable projection light meter is readily available which projects on a screen with standard G-E light meter scale.

Write Lamp Department, Nela Park, Cleveland, Ohio, for Bulletin LS-112, which describes the above instruments.

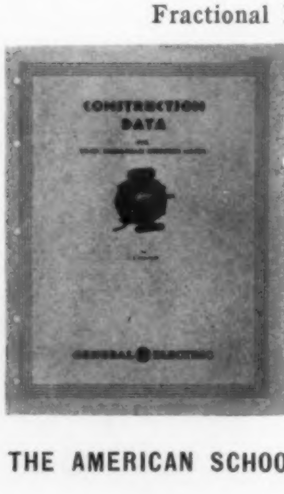
Apparatus Department

Turbines

"Gas Turbines and Turbo-superchargers, GET-1090"

Many bulletins are available on steam turbines. Since the advent of gas turbines, the booklet illustrated is quite popular.

Fractional H-P Motor Kits



"Construction Data for 1/4 h-p, Single-phase Motors"—GEA-3514A

"Construction Data for 1/2 h-p, Single-phase Motors"—GEA-3526

"Construction Data for 1/2 h-p, 3-phase Motors"—GEA-3542

These bulletins describe educational motor kits which may be purchased for assembly by students. Certain machining operations, in addition to winding the stator and assembling the parts, combine to make each of these motors a very desirable educational project. Similar bulletins are available for a d-c motor and a small transformer.

Meters and Instruments

"Manual Electric Instruments—Construction and Operation Principles"—GET-1087

Price $1.00

The purpose of this manual is to contribute to more effective use of electric instruments by explaining their operating principles, and by illustrating the application of these principles in the instrument commonly used for electrical measurement. Based upon teaching material successfully used in the training courses of the General Electric Company, this manual is written for use in technical schools and colleges, in training courses for the armed forces, and as a refresher course for engineers who want to improve their acquaintance with the measuring tools of electrical industry. All the basic electrical measuring instruments are treated, but electronic instruments have in most part been omitted because they represent certain developments rather than electro-mechanical structure and, therefore, are not within the scope of a manual devoted to fundamentals.

"Measurements — Equipment and Technique—Volume 3" — GED-1157

This book consists of three groups of papers written by engineers of the General Engineering & Consulting Laboratory and from the Instrument Engineering Division. Part 1 describes the recent developments in science and engineering; part 2 describes new equipment for measurements and part 3 new techniques.

Meters and Instruments

"Instrument Digest"—GEA-4861

This digest is a condensation of prices, specifications and description of the more popular types of electric indicating and recording instruments. It is intended as a handy guide and has been made compact for ready reference. Description and specifications have been limited to those essential data required for ascertaining the suitability of the instrument to a particular application. Ammeters, voltmeters, and wattmeters, both indicating and recording, a-c and d-c, are included.

"Specialized Testing and Measuring Equipment Catalog"—GEA-639

This book gives information on more than 90 modern equipments for specializing testing and measuring. Some of the equipments were developed for General Electric's own factories and laboratories. Other equipments were developed at the request of factories and laboratories of other companies, and since then have been made available throughout industry. The descriptive matter on each device includes the G-E bulletin number for it, and any of these bulletins may be ordered if more details are desired.

Gaging

Various electrical gages are available to measure nonelectrical quantities. This information should be of interest to instructors in machine shop practices but many other gages for vacuum, thickness, etc., are also available.

Amplidyne

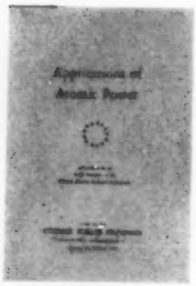
"The Short Circuit That Moves Mountains"—GEA-4053A

This versatile machine puts a short circuit to work. In principle it is an externally driven d-c generator. It is a dynamic amplifier, whose winding may be used to create such a precise electrical balance that the smallest electric signals release kilowatts of output. This machine is useful in close control of electrical equipment of all sizes.

Induction Motor with Seventy-two Terminals

The photograph of the induction motor shows the Type A225 2-hp, 220-volt, 36 coil induction motor for 2-, 4-, 6- and 12-pole connections, three-phase, and for 2- and 6-pole connections, 2-phase. This is a special educational motor with all coil leads brought out to facilitate changes in connections for experimental purposes.

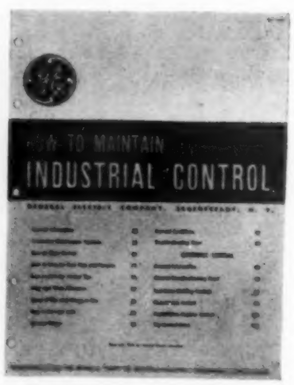
Nucleonics



"Applications of Atomic Power"

Bulletin APB-2 contains six addresses by staff members of the General Electric Research Laboratory. Other bulletins are available which give detailed information on equipment for nuclear research, such as betatrons, cyclotrons, etc.

Maintenance

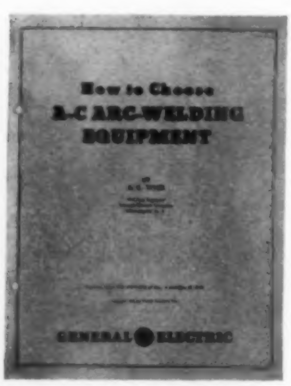


"How to Maintain Motors and Generators"—GET-1202

"How to Maintain Industrial Control"—GET-1195

Preventative maintenance programs in industry are too few despite the considerable savings such programs effect. The two bulletins mentioned, and many others, are available to assist the students in understanding the important points involved, and the renewal parts that are usually necessary.

Arc Welding

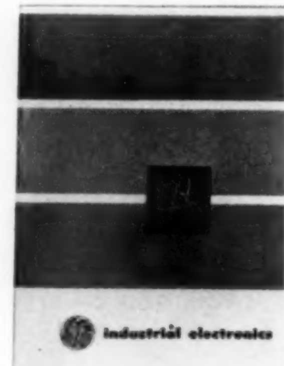


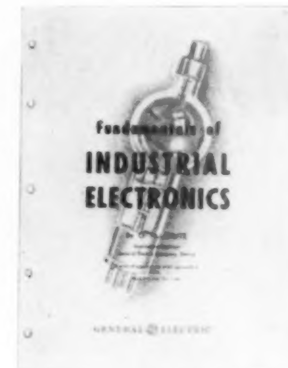
"How to Choose D-c Arc Welding Equipment"—GEA-3795

"How to Choose A-c Arc Welding Equipment"—GEA-3796

These bulletins give performance data and tell how to get the most out of welding apparatus. The points of view of management, the welding foremen, and the operators are presented. Attention is called also to design and safety features that should be considered in selecting the proper equipment. Both bulletins are required to show where a-c equipment best fits into the production picture and to compare its performance with d-c equipment.

Industrial Electronics





"Fundamentals of Industrial Electronics"—GEA-4309

This includes a series of eight articles by an application engineer.

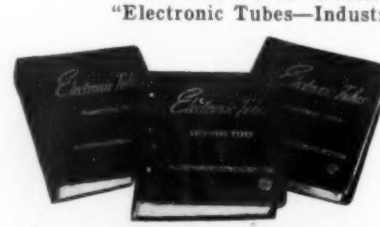
"Industrial Electronics"—GEA-4227

This describes some of the electronic applications made by General Electric, in a pictorial presentation, with a short description. In 1943, more than 25,000,000 kw hours or about 10 per cent of all electric energy generated in the United States, passed through electronic rectifiers.

See page 81 for Industrial Electronics course.

Electronics Department

"Electronic Tubes—Transmitting Types"
"Electronic Tubes—Receiving Types"
"Electronic Tubes—Industrial Types"



These manuals are complete with technical and mechanical information for every tube use. Their easy-to-read graphs and tube outlines help solve application problems.

The price of these manuals is $3 for Transmitting Types $3 for Industrial Types and $5 for the Receiving Types, plus a maintenance charge of $1 per year for each annual.

Construction Materials Department

Electrical Modernization Guide 51-52

A two-color, 20-page brochure on home wiring modernization. Contains information on bringing wiring up-to-date with minimum bother and expense. Brochure is well illustrated and has many diagrams and check lists, as well as a summary table of required outlets.

Farm Industry

"G-E Farm Wiring Guide," 61-46

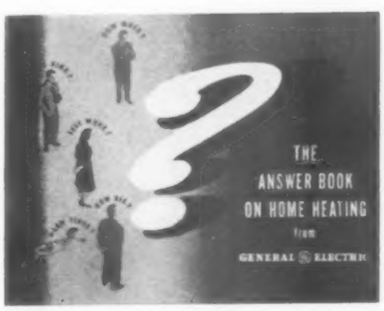
This two-color, 56-page book on farm wiring contains necessary information for planning wiring for practically any farm. Layout sheets are provided so that the wiring for each specific purpose can be determined. Contains many illustrations, charts, and diagrams.

Chemical Department

"Materials—(Plastic-Electrical Insulation-Metallurgical)"— 1B/18

General Electric manufactures molded and laminated plastics including silicone rubber, electrical insulating materials, and metallurgical materials, such as Alnico permanent magnets. This bulletin gives general information about these products and references to other bulletins providing detailed information.

Chemical and Metallurgical training programs are described in Bulletin CDG-40.



Air Conditioning Department

"The Answer Book on Home Heating" SP-00-90

The one-pipe steam system, two - pipe steam system, forced hot water system, warm air conditioning and the split system are all described in this booklet, which will help you pick the proper heating plant for the home. The radiant-panel heating system, solar radiation and the "heat pump" are also discussed. Summer air conditioning teamed with the boiler or warm air conditioner is included, making this book very useful to classes studying any phase of air conditioning.

Career opportunities in the Air Conditioning and Refrigeration business are described in Bulletin SP-00-29.

General Electric X-Ray Corporation

"Industrial X-Ray Units"— 7A-700

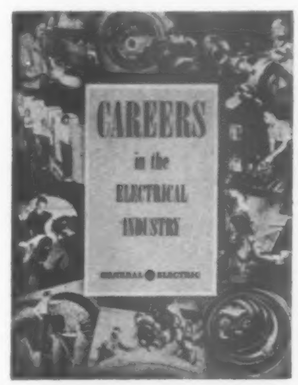
Foundries in technical schools and colleges will be interested in this bulletin. The G-E million-volt industrial engineering unit is described with information about the use of x-ray units in industry.

Trumbull Electric Manufacturing Company

"Trumbull Electrical Control Apparatus," 6B/6

This bulletin describes briefly switches, starters, busways, circuit-breaker panelboards, and illustrates manually operated theater and area lighting control. For more detailed information about these products, ask for the "Trumbullist."

Other Services for Teachers



Many special bulletins are available to aid the teacher in the classroom and to assist in vocational guidance. Some of these are:

"Careers in Electrical Industry," APD-2

"Adventures in Electricity," GEC-174, APG-17, APG-17-1, APG-173

These are a series of booklets in color using the "comic" technique to explain the generation, use and distribution of electricity. A similar bulletin, APG-17-2, is also available on "Jet Propulsion."

Motion Pictures

"Motion Pictures"—APB-21

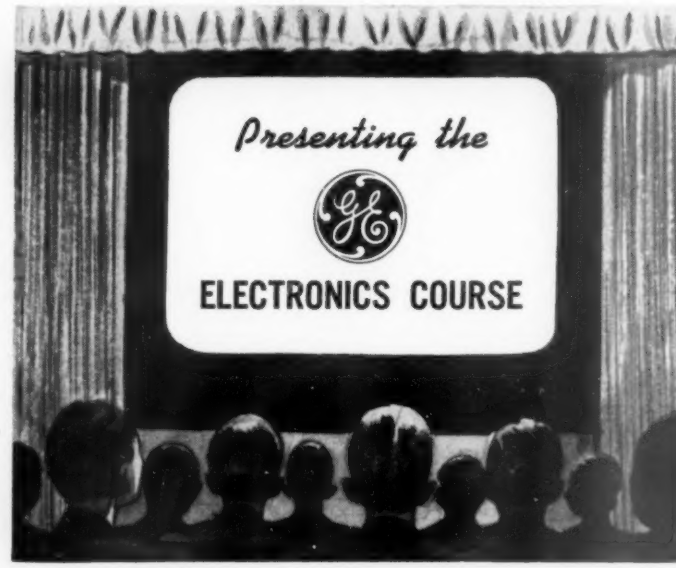
General Electric "Motion Pictures" offers more than 50 films, which are rented at no cost except the transportation. These films include the subjects of jet propulsion, television, x-ray, radio broadcasting, as well as a number of special subjects. A copy of the catalog will be sent you on request.

Photo News Service

For many years, college students and high school pupils have enjoyed the twice a month Photo News in classrooms, laboratories and libraries. These 14 x 17 in. posters deal with many phases of science and engineering; they keep abreast of recent developments and furnish material newer than that included in the latest text books. If your school does not enjoy this service, and will request it, an attractive wooden frame will be sent with the first poster and your name added to the mailing list.

More Effective Teaching Retained 35% Longer

Visualized . . . Packaged . . . Practical . . .



A talking slidefilm course in Industrial Electronics produced by the leading manufacturer of Industrial Electronics equipment! Excellent for fundamental instruction or review for advanced physics, electrical and other technical students anxious to take their places in the growing world of Industrial Electronics. Visual aids were found to teach 35% faster, provide 35% longer retention by the United States Armed Forces.

Scores of schools, colleges, businesses, industries, unions, and utility companies have purchased and used these kits in their training programs. Every sequence of this 12-part course has been put to test on groups of widely different education levels. Educators have joined plant executives in praising its **combination of easy understanding and technical accuracy.**

Announced a short time ago by General Electric, this kit has already become a powerful teaching aid. Among the hundreds of purchasers are:

19 colleges and junior colleges including, **Illinois Institute of Technology, Cornell, University of California, Purdue, West Point, University of Wisconsin,** and others.

14 city school systems including **Los Angeles, Detroit, Philadelphia, Syracuse, Minneapolis, San Francisco, Spokane,** and others.

20 leading trade and vocational schools all over the country.

11 government and military groups.

Over 200 industrial concerns.

The arduous but essential task of teaching fundamentals becomes easy with the help of these individual films and lesson books on the 12 following subjects:

1. **Harnessing the Electron**
2. **Electronic Tubes as Rectifiers**
3. **Grid Control of Electronic Tubes**
4. **Fundamentals of Electricity, Part I**
5. **Fundamentals of Electricity, Part II**
6. **Electronic Relay Systems**
7. **Electronic Rectifier Equipment**
8. **Thy-mo-trol (Thyratron Motor Control)**
9. **Electronic Control of A-c Power**
10. **Electronic Frequency changing**
11. **Photoelectric Systems**
12. **Electronics, Today and Tomorrow**

See page 643 for data on G-E floodlighting equipment

Here's what you get

12 SLIDEFILMS AND RECORDED TALKS—each about 1/2 hour long.

300 REVIEW BOOKLETS—25 sets of 12 individual lessons, keyed to slidefilms.

1 INSTRUCTOR'S MANUAL—a 140-page book with hundreds of illustrations and detailed steps for conducting the course.

1 CARRYING CASE—attractive and strongly built, it holds records, films, and manuals.

THE PRICE—for the complete "package" as above, $100; *extra* manuals, $3; *extra* sets of 12 *review booklets*, $2.

FREE TRIAL OFFER—Because we are anxious for you to inspect this kit, we will loan one to you, free of charge, for a 10-day period.

ORDERS—can be placed through any local G-E office, or write directly to Apparatus Department Section 640-202, General Electric Comany, Schenectady 5, New York. For additional information write for Bulletin GES-3303A.

All you need is a sound slidefilm projector (35 mm, 33 1/3 rpm) and a screen.

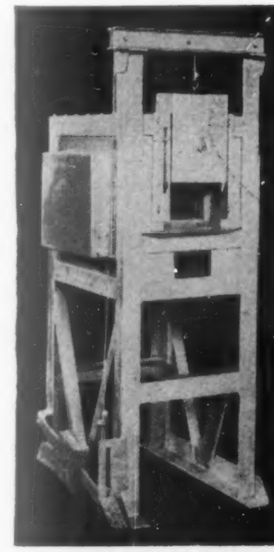
HARPER ELECTRIC FURNACE CORPORATION

1440 Buffalo Avenue • Niagara Falls, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

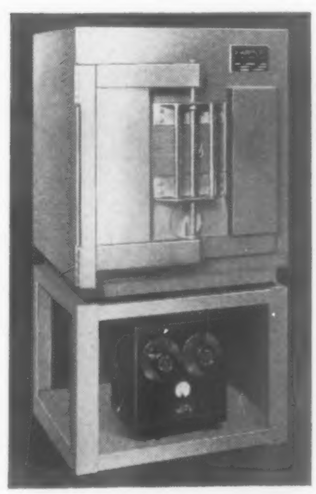
INCORPORATED 1924

Harper High Temperature Electric Furnaces and Kilns provide instructors with sturdy, dependable classroom and laboratory equipment which can be operated with confidence. Complete range of types and sizes covers many vocations in modern curriculum. Accurate control makes it possible to repeat proven heating schedules from term to term. Large classes can be handled economically by operating 2 or more furnaces or kilns from a single transformer. Harper Electric Furnaces and Kilns are proved and approved by schools, industries, potteries and studios. Write for data.



ELECTRIC KILNS

Proven firing schedules can be repeated from term to term. Designed for firing entire range of clays including finest porcelains with temperatures up to cone 13. Also for enameling on metals and applying overglaze decorations on china and glassware at low temperatures.



HEAT TREATING FURNACES

Temperatures up to 2750° F. with Globar non-metallic heating elements make this a versatile furnace for training work. Floor and bench models —various sizes.

Harper Electric Furnaces are equipped with Globar non-metallic heating elements.

LABORATORY FURNACES

For rapid heating to temperatures from 1500 to 2750° F. Uses include alloy, cement and glass melting tests, dehydration, oxidation, calcining, preparing enamel frits, etc.

PIT TYPE FURNACES

Uses include heating materials in crucibles . . . making powdered metal parts . . . operation either at atmospheric pressure or under vacuum . . . Globar non-metallic heating elements arranged to insure uniform temperature throughout the heating chamber.

WRITE FOR DATA ON HARPER HIGH TEMPERATURE ELECTRIC FURNACES

BROWN & SHARPE MFG. CO.

Providence 1, R. I.

Established in 1833

MACHINISTS' TOOLS

Micrometers	Gages
Combination Squares	Indicators
Vernier Tools	Toolmakers' Tools

MILLING CUTTERS

Helical Milling Cutters	Metal Slitting Saws
Side Milling Cutters	Gear Cutters
Spiral End Mills	Hobs

ARBORS, ADAPTERS AND COLLETS

Cutter Arbors	Adapters
Cam Lock Adapters	Collets

SCREW MACHINE TOOLS

Stock tools for turret and cross slides for every ordinary screw machine requirement.

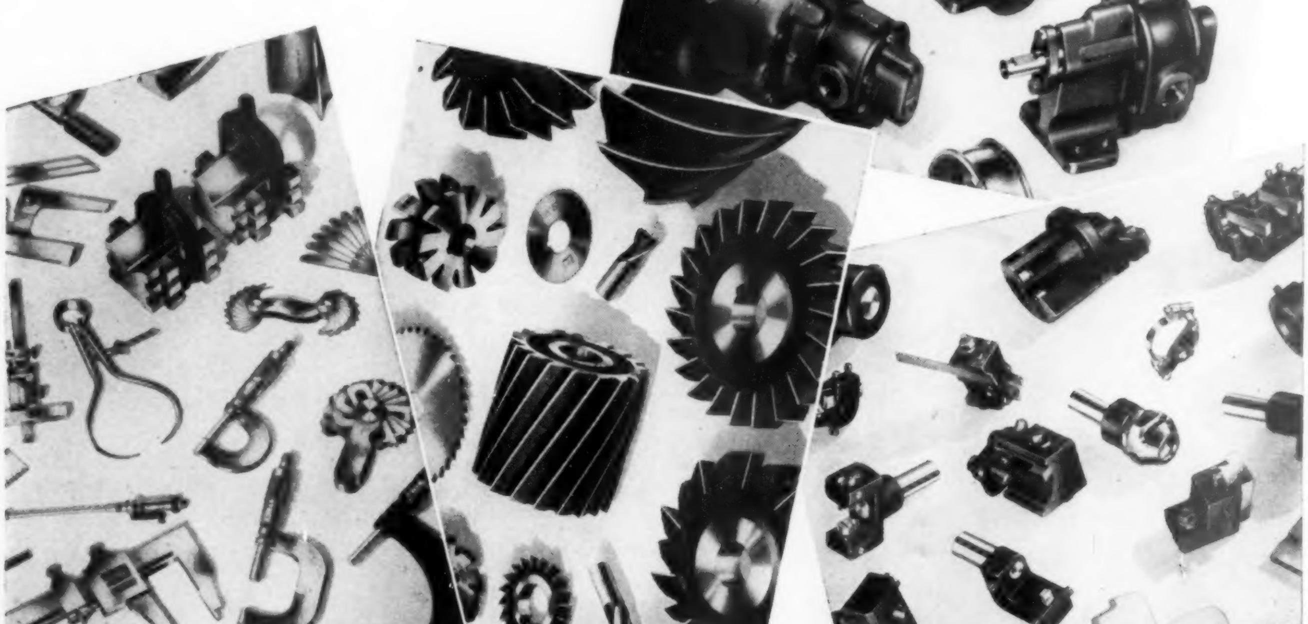
PUMPS

Rotary Geared	Centrifugal
Vane	Motor Driven

OTHER USEFUL EQUIPMENT

Ground Flat Stock	Cast Iron Surface Plates
Permanent Magnet Chucks	Bench Centers
Vises	Gear Testing Fixture
Cast Iron Straight Edges	Index Plates
	Electronic Measuring Equipment

(See listing of Brown & Sharpe Machine Tools on page 604)



GREENLEE TOOL CO.

DIVISION OF GREENLEE BROS. & CO.

1716 Columbia Avenue, Rockford, Ill.

CRAFTSMANSHIP COMES EASIER WITH GREENLEE WOODWORKING TOOLS

NEW FREE FOLDER S-122 showing complete line of GREENLEE tools for the woodworker. Write for your copy today. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1716 Columbia Ave., Rockford, Illinois, U. S A.

The teaching of precision workmanship is so much easier when your woodworking shops are equipped with the finest of tools. Students learn faster, are more interested, get the feel of true craftsmanship. That's why it pays to look to GREENLEE for hand tools and machine bits of highest quality as shown here.

• CHISELS, GOUGES, TURNING TOOLS

Chisels for all types of work — carpentry, cabinet making, framing. Line includes socket butt and firmer styles. Blades are of special-analysis, high-grade crucible steel for long-lasting, fine-cutting edges. Highly-polished finish, perfect balance, hand-fitting handles. Also complete selection of high-quality gouges and turning tools.

• AUGER BITS, DRILLS, COUNTER SINKS

Auger bits for every need . . . all types of twists and heads. Cutting parts accurately sized to indicated diameter . . . twist ground for sure clearance . . . correctly shaped and proportioned spurs. Sharp cutting edges and each tool tested in wood. Also brace drills and countersinks.

• EXPANSIVE BITS

Fast, easy-boring . . . with free, positive chip clearance! Specially-designed wide, open throat assures smooth, uninterrupted action. All parts expertly designed and processed of top-quality steel. Made in two styles . . . Set-fast as illustrated or Plain.

• AUTOMATIC PUSH DRILLS

Built for long-time, accurate, smooth performance. Completely enclosed working parts stay dirt and grit free! The special phosphor bronze drive nut easily withstands constant, heavy usage. Handle houses the 8 drill points regularly supplied. Heavy chromium plating protects all exposed metal parts.

• SPIRAL SCREW DRIVERS

Sturdily constructed of highest quality materials for long, hard service. Special phosphor bronze drive nuts reduce friction to a minimum. Quick-action shift button provides easy, positive adjustments. Finished in polished chromium with hardwood handle.

• MORTISING AND BORING TOOLS

Renowned for their long life, GREENLEE tools for woodworking machines are made of the finest materials and are accurately ground. Line includes Hollow Chisels, Machine Bits, Drills, Multi-Spur Bits, and other tools.

TOOLS FOR CRAFTSMEN

GREENLEE

MILLERS FALLS COMPANY

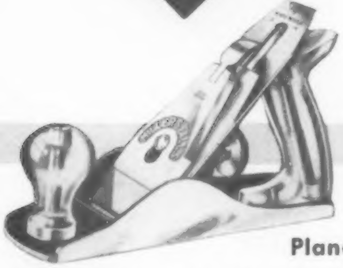
Greenfield, Massachusetts

28 Warren St., New York City   100 So. Jefferson St., Chicago, Ill.

MILLERS FALLS TOOLS SINCE 1868

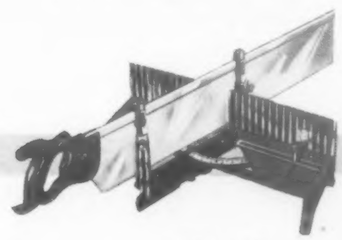
Modern design, fine workmanship, and high quality are combined in Millers Falls tools. You can rely on them for the utmost in ease of operation, accuracy and durability. That is why they have been the first choice for many years in leading schools and universities.

There are hundreds of Millers Falls hand and electric tools for shop, laboratory and maintenance use. Write today for our complete catalog.



Planes

An unbeatable line, developed through years of quality tool building. Many kinds and sizes—smooth, jack, fore, jointer, block, rabbet, router, rabbet and fillister.

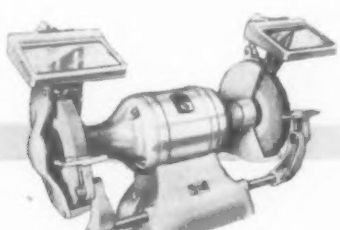


Mitre Boxes

The accuracy and rugged construction of Langdon Acme and Goodell All-Steel Boxes are traditional. Depend on them for years of satisfactory service.

Hand, Breast and Automatic Drills

A wide variety of styles, single and two-speed models with chuck capacities up to $\frac{1}{2}$ inch covering a good price range answers every reasonable requirement in this line.

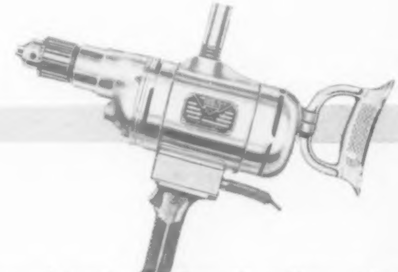


Bench Grinders

Three sizes, 6", 7" and 10", all amply powered with 1/3 h.p. to full 1 h.p. motors. All voltages and cycles. Illuminated eye-shields and pedestals.

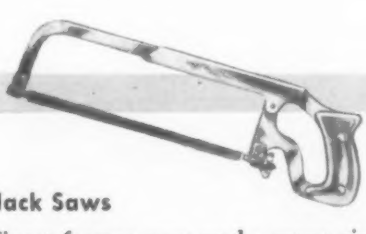
Levels

Carpenters' and Masons' wood levels with single or double vials in all of the most generally-used lengths. Also aluminum, torpedo and line levels are available in various sizes.



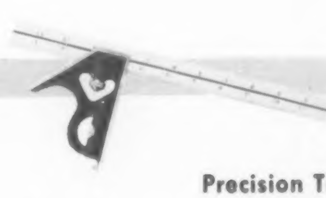
Electric Drills

Complete line—3/16" to 1". Other portable electric tools include: screw drivers and nut runners; grinders; hammers; disc sanders; polisher. Stands, adapters, accessories.



Hack Saws

Finest frames ever made, many sizes and styles. Blades for all uses: Tuf-Flex, general-purpose hand blade, super-tough, super-flexible, cuts thin-walled tubes or tough tool-steel rods without stripping or breaking. Blu-Mol Double-Life, sensational new blade with cutting edge on each side, now in widespread industrial use, should be demonstrated in every school shop.



Precision Tools

Combination squares — all of approved design and guaranteed accuracy: rules; micrometers; thickness gauges; calipers and dividers; screw pitch, depth, center, surface gauges; squares; sets; and bevel protractors.

Braces

Finest line of braces made: standard, ratchet, corner. Proved design, ball bearing construction, free action ratchets. Easy to handle, they meet every boring requirement with speed and efficiency.

One thing in common—QUALITY!

STANLEY TOOLS
EDUCATIONAL DEPARTMENT
New Britain, Conn.

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FOR YOUR COPY STANLEY TOOL CATALOG

Now Includes
"YANKEE" TOOLS
RUSSELL JENNINGS BITS
(Divisions of Stanley Tools)

. . . *Tools for every school shop*

FOR WOODWORKING AND FARM SHOPS
The most complete line offered by one manufacturer.

FOR ELECTRICAL SHOPS
Hammers, bit braces, bit extensions, screw drivers, etc.

FOR SHEET METAL SHOPS
Hammers, chisels, punches, etc.

FOR AUTOMOBILE SHOPS
Hammers, chisels, punches, screw drivers, etc.

FOR MACHINE SHOPS
Hammers, rules, chisels, punches, levels, etc.

FOR FORGE SHOPS
Anvil tools, tongs, hammers, etc.

SET OF *36* SAFETY CHARTS

offered to Schools by Stanley at cost

• Bold, pictorial "cause and effect" safety posters, printed in color on heavy cardboard, lacquered and eyeleted for hanging on wall. Yours for cost of printing and postage. . . . $2.50 per set, postpaid, anywhere in U. S. A.

Other visual teaching aids and comprehensive project plans available at cost. Write for literature.

STANLEY TOOLS
Educational Dept., New Britain, Conn.

THE TOOL BOX **STANLEY** OF THE WORLD
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HARDWARE · HAND TOOLS · ELECTRIC TOOLS

THE L. S. STARRETT COMPANY

World's Greatest Toolmakers

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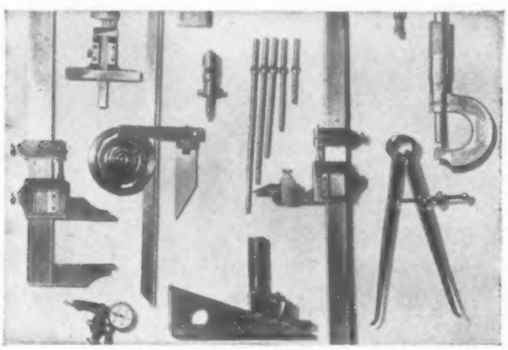
PRECISION MEASURING TOOLS • DIAL INDICATORS • STEEL TAPES
HACKSAWS • BAND SAWS FOR CUTTING METAL, WOOD, PLASTICS

Your tool dealer can show you a complete line of Starrett Tools for school shop use priced to fit your budget. For complete information, write for Starrett Catalog 26 SU.

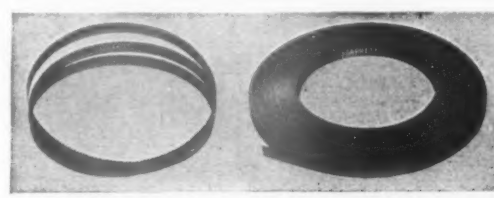


STARRETT PRECISION MEASURING TOOLS

The fine workmanship and lasting accuracy that have made Starrett Tools the choice of skilled machinists have also made them standard school shop equipment. The complete STARRETT line includes a wide selection of Micrometers, Verniers, Calipers, Gages, Protractors, Squares and other mechanics' hand measuring tools and Precision Instruments.

STARRETT HACKSAWS

STARRETT Hacksaw Blades cut faster and last longer. There is a STARRETT Hacksaw for every job—Standard Flexible Back, All Hard and "Semi-Flex," "S-M" Molybdenum, "Safe-Flex" Class A—High Speed Steel and 18-4-1 High Speed Steel—for all kinds of hand sawing; "S-M" Molybdenum for light and heavy power sawing and High Speed Steel for power sawing of high alloy metals, stainless steel, phosphor bronze, tool steel, monel, etc.

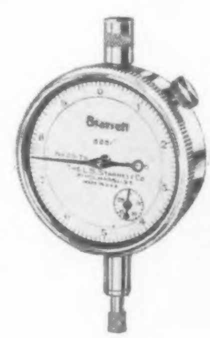


STARRETT BAND SAWS FOR METAL, WOOD AND PLASTICS

STARRETT hard edge, flexible back Metal Cutting Band Saws are available in 10 widths, 3 gauges and 8 pitches, in coils of any length or cut to length and welded. STARRETT "Skip-Tooth" Band Saws are available for fast cutting of magnesium, aluminum and other non-ferrous metals, also for wood, plastics and special compositions.

STARRETT DIAL INDICATORS

STARRETT Dial Indicators are made in a full range of types, sizes, ranges and dial calibrations to meet American Gage Design Specifications and to suit every indicating or comparing need. STARRETT also makes Dial Test Indicators and the widely popular LAST WORD Indicators.



STARRETT STEEL TAPES AND RULES

STARRETT Steel Tapes are made for every purpose in lengths and graduated to suit every requirement. STARRETT Steel Rules are standard for accuracy, easy to read, made to suit every need or preference.

STARRETT EDUCATIONAL BLUE PRINT SETS

A valuable and practical instruction aid on the use of precision tools. The Set consists of fourteen blue-printed 8" x 10½" punched sheets, each illustrating an important tool and its uses. Furnished to instructors and students at cost—10 cents per set.

THE STARRETT BOOK *for* STUDENT MACHINISTS

A handy source of information student machinists must have about tools, machines and modern methods. Prepared in cooperation with leading vocational training experts, it is written in simple shop language, contains more than 200 illustrations and 30 useful reference tables. Available through your local Starrett Tool distributor at one dollar a copy. Descriptive Folder furnished on request.

THE BLACK & DECKER MFG. CO.

Towson, Maryland

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Atlanta	Cleveland		Kansas City	Newark
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Black & Decker
ELECTRIC TOOL HEADQUARTERS

¼" HOLGUN DRILL

A perfectly proportioned "Handful of Power." Completely ball-bearing equipped and built for all types of drill service. Operating balance is second to none.

	Standard Speed Model	Low Speed Model
Capacity in steel	up to ¼"	up to ¼"
No-load Speed	1700 R.P.M.*	500 R.P.M.†
Weight: Net	2¾ lbs.	3 lbs.
Shipping	4¼ lbs.	4½ lbs.
Overall length	6¾"	7⅛"
Spindle Offset	⅜"	⅜"
Cat. No.	345	346
Price, complete, specify voltage	$35.00	$41.00

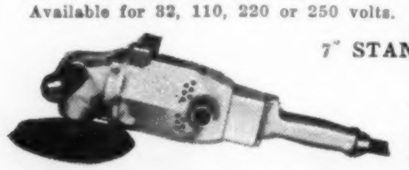
* Optional speeds (no extra cost)—2500, 3500 or 5000 R.P.M.
† Optional speeds (no extra cost)—750, 1000 or 1500 R.P.M.

½" STANDARD DRILL

The most popular general purpose Electric Drill. Spindle speed is ideal for driving all types of twist drills, Hole Saws and wood augers. Spline mounted spindle gear increases strength, minimizes friction and wear. Ball-bearings throughout unit.

Capacity in Steel, ½"; No-Load Speed, 400 R.P.M.

Net Weight, 10¾ lbs.; Overall Length, 13¾".
Price, complete, specify voltage—(Cat. No. 361) $55.00
Available for 32, 110, 220 or 250 volts. Universal Motor.

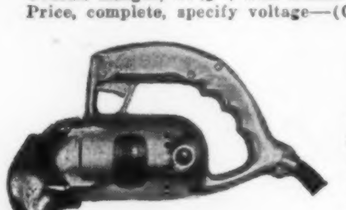


7" STANDARD SANDER

Will also grind, wire brush and do wood planing with attachments.

The popular general-purpose Sander for varied shop use.

No-Load Speed, 4200 R.P.M.; Net Weight, 12¾ lbs.
Overall Length, 17½"; Pad Diameter, 7".
Price, complete, specify voltage—(Cat. No. 92) $60.00



PORTO-SHEARS

(NO. 16 MODEL, Illustrated)

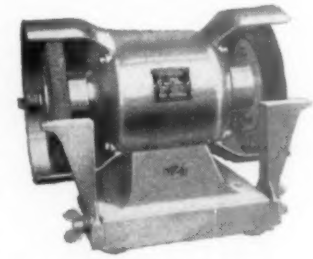
Cut all types of sheet metal quickly, easily and accurately. Accurately follows straight or irregular pattern lines as the cutting edge is always visible.

Specifications

Capacity: in Steel (U. S. Std.)	18-gauge	16-gauge
Cutting Speed: No-Load	2500	2500
(Strokes per minute): Full-Load	1500	1500
Weight: Net	5⅛ lbs.	8½ lbs.
Overall Length	9⅛"	12⅛"
Cat. No. 11 (specify voltage)	258	259
Price, complete	$75.00	$78.00

ELECTRIC BENCH GRINDERS

6" STANDARD BENCH GRINDER



A full quality Black & Decker unit with full size bearings throughout, wheel guards, tool rests and convenient handle — unusually low in price.

Wheel Size ......6" x ⅝" x ½"
Motor Rating ....¼ H.P.
Not universal
Price for all 1-phase A.C. voltages and cycles $38.00

6" HEAVY DUTY BALL BEARING BENCH GRINDER

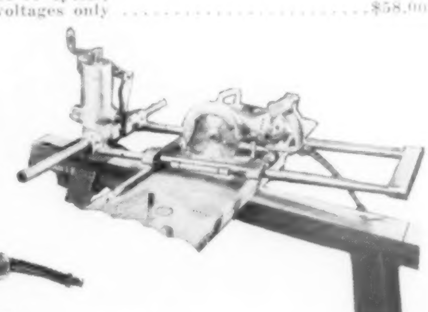
For heavy duty service and longer life this unit is equipped with ball bearings, also enclosed wheel guards, tool rests

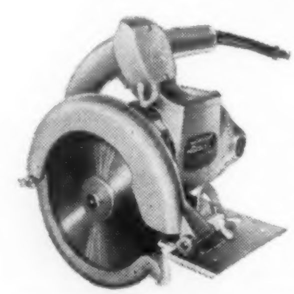
Wheel size ....6" x ¾" x ½"
Not universal
Motor rating ....⅓ H.P.
Price for 110 volts, 50-60 cycles, Single phase A.C. voltages only $58.00

QUICK-SAWS

7" Quick - Saw mounted in NEW Quick-Saw Arm.

8" Quick - Saw shown below.





Quick-Saws feature complete safety, adjustable depth of cut, adjustable angle, increased power, perfect balance, 2-pole instant release switch, sturdy gear and bearing construction. Telescoping guard covers blade except when cutting—springs close as Saw emerges from cut.

Model	Blade Diam.	No-load Speed, R.P.M.	Max. Cut, Depth	Net Wgt.	Ship. Wgt.	Cat. No.	Price
7" Quick-Saw	7¼"	3200	2¾"	19 lbs.	38 lbs.	260	$115
8" Quick-Saw	8⅛"	5000	2⅝"	20 lbs.	45 lbs.	382	$135
9" Quick-Saw	9¼"	2500	3⅛"	26 lbs.	54 lbs.	375	$150

STANDARD EQUIPMENT: (all units) 3-wire cable and plug, Combination Rip and Cross Cut Blade, Carrying Case. Universal Motors, operate on A.C. or D.C. Standard Voltage, 110; also available for 220 or 250 volts.

NEW QUICK-SAW ARM (shown above): Quick-Saw Arm quickly converts portable Quick-Saw to versatile radial Saw; multiplies utility of portable saw, improves speed and accuracy on any of these cuts: cross-cut, mitre, bevel, compound angle, ripping.

Net Wt. (not including saw), 42½ lbs.
Angle of Cut—0° to 180°; Bevel Angle—0° to 45°.
Cat. No. 31617. Price Complete $148.00

Complete line includes: Drills, Drill Stands, Hole Saws, Screwdrivers, Nut Runners, Tappers, Hammers, Saws, Glue Pot, Bench Grinders, Die Grinders, Portable Grinders, Shears, Sanders, Buffers, Vacuum Cleaners, Valve Shop, Valve Refacers, Valve Seat Grinders and Supplies. **COMPLETE CATALOG SENT ON REQUEST.**

PORTER-CABLE MACHINE COMPANY

3000 N. Salina Street, Syracuse 8, N. Y.

YOUR STUDENTS SHOW MORE INTEREST WITH PORTER-CABLE POWER TOOLS . . .

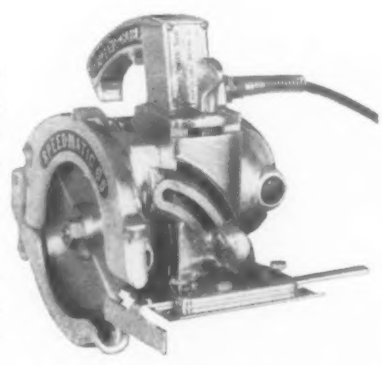
SANDER MODEL A-2

Easy to use . . . Safe . . . Lasts indefinitely

On flat, straight or curved surfaces, this time-tested belt sander produces a beautiful, professional finish. Eliminates hand-sanding, scraping, and planing. Smooths glue joints. Removes paint and varnish. Cleans right down to the wood evenly and smoothly. Can be mounted in a vise to approximate a bench sander or spindle sander.

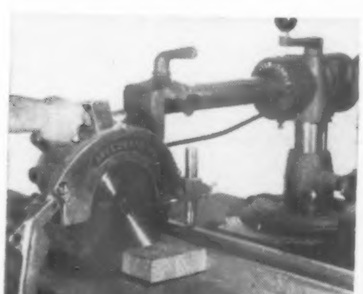
SPECIFICATIONS: Powerful motor drives 2" wide x 21" long abrasive belt at 600 surface feet per minute. Plugs into ordinary light socket, operates in any position, weighs only 12 lbs.

SPEEDMATIC SAW



A Speedmatic is a balanced, powerful saw built for easier, one-hand operation. Any student can use it with absolute safety.

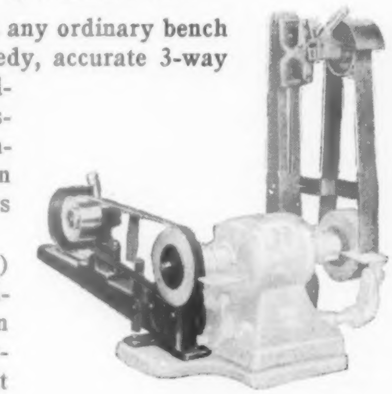
Its extra - wide guide shoe assures truer cutting. Speedmatic does not veer, tip or twist. Does not require premarking. Easily adjustable for various cuts: angle or depth, rip, cross-cut, mitre, dado, bevel or groove. Cuts wood, composition, light metals.



Retractable Radial arm makes the Speedmatic a versatile bench saw. Radial arm always keeps work in sight. Radial Arm supplied at slight extra cost.

SPECIFICATIONS: Model K-75 has 3/4 HP. AC.-DC. motor, 25-60 cycle, 1 phase, 110 or 220 volts. Saw blade is 7½" diam. with a maximum cut of 2½". Saw speed (idle) is 7000 RPM. as it enters cut. Net weight—14½ lbs. Porter-Cable saws available in 4 other sizes, with blades of 7", 8", 10¼", 12".

HANDY GRINDER, MODEL N-2



Quickly converts any ordinary bench grinder into a speedy, accurate 3-way abrasive belt grinder. In many industrial shops it increased production over bench grinders by 200%.

The N-2 does: (1) light contact grinding; (2) platen grinding and (3) irregular surfacing. It is quickly and easily adjustable for use in any position within an arc of 90°.

Fully exposed grit on abrasive belt cuts faster and more smoothly than a wheel. Contact roll remains flat at all times, as work is applied against the belt only—roll is protected against grooving and gouging.

SPECIFICATIONS: Over-all height, complete attachment—27". Width of frame 2½". Size of base (T shape with 3 holes for mounting) 6" x 7". Adjustable platen—2" x 4". Abrasive belt—2" x 48" (1" or 1½" optional). Shipping weight—19 lbs.

STREAMLINE YOUR TEACHING WITH MODERN ABRASIVE BELT MACHINING METHOD

The Porter-Cable WG-4 does metal surfacing . . . burrs, bevels, knocks off corners, flashes and tits . . . chamfers, squares, cuts radii, grinds tools. Works equally well on plastics and glass.

The WG-4 can be used for **precision** surfacing. Combines all the advantages of Wet Belt Machining Method, in both line contact and platen grinding. Since the belt runs wet and cool, the grindings do not "fuse" or load the belt.

WRITE TODAY for more information on the new Porter-Cable Abrasive Belt Machining Method.

SEE Porter-Cable page in Maintenance Section of this issue for other useful machines.

SKILSAW, INC.

5033 Elston Ave., Chicago 30, Ill.

ELECTRIC PNEUMATIC

SKILTOOLS

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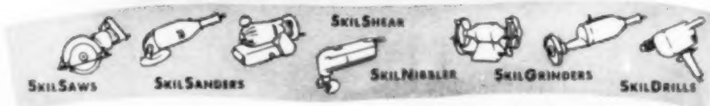

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Los Angeles, Memphis, Miami, Minneapolis, Newark, New Orleans, New York, Pittsburgh, Philadelphia, Portland, St. Louis, San Francisco, Seattle, Toronto

MADE BY SKILSAW, INC.

TRAIN STUDENTS with PROFESSIONAL TOOLS

Vocational training students learn faster, do better work when using the tools widely preferred in the industrial, contracting, installation and maintenance fields. Help them become better fitted for jobs, better prepared to advance more rapidly, by teaching with professionally preferred SKILTools.

School maintenance men know the time and labor saving possible with these modern tools on such school jobs as: refinishing desks and blackboards, installing equipment, sanding floors, building partitions.

Ask your school supplies distributor for a copy of the new 64-page SKIL TOOLS Catalog

SKIL BELT SANDER MODEL "9" (Formerly ZP)

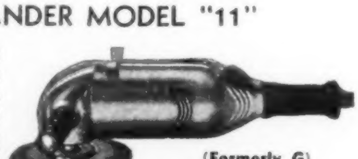
3" Wide Belt

Most popular sander for schools. Ideal for manual training and school maintenance. Produces a perfectly smooth, ripple-free finish . . . speeds all sanding of wood, metals, stone and composition materials. Belt easily removed or centered. Momentary contact trigger switch for safety. Free belt speed 1200 ft. per minute. Size overall 4¼" x 13¼" x 7" high. Net weight 13¼ lbs. Equipped with resilient backed metal pad; 10 ft. of 3-conductor cord and connector; medium grade SKIL Sander Belt; lubricant. Standard voltage 115, D.C. or A.C.

MODEL "9", each **$98.00**

2¼" and 4½" SKIL Belt Sanders also available

SKIL DISC SANDER MODEL "11"



(Formerly G)
7" Heavy Duty

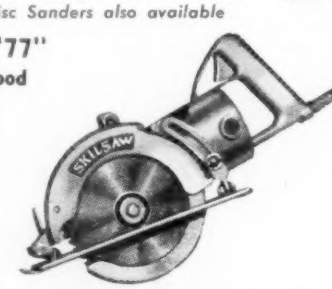
For grinding down welding beads, removing scale from castings, etc. Used with sanding discs, wire cup brushes, cup grinding wheels, rubbing pads and polishing bonnets. No-load speed 3600 R.P.M. Length overall 16¾" not including pad. Net weight 12½ lbs. Equipped with 10 ft. of 3-conductor cord and connector; detachable handle; tool rest; 7" pad; 3 sanding discs, wrench. Standard voltage 115, D.C. or A.C.

MODEL "11", each **$69.00**

2 other SKIL Disc Sanders also available

SKIL SAW MODEL "77"

Cuts 2⅜" Deep in Wood



The greatest value among 7¼" saws. Crosscuts 2" rough lumber, bevel-cuts 2" dressed lumber at 45°. Quick adjustment for both depth and bevel cutting. Cuts metal, stone, concrete, tile and composition. Maximum cutting in wood 2⅜". Automatic telescoping guard shields saw blade. Length overall 17¼". Net weight 15 lbs. Equipped with one combination blade; 10 ft. of 3-conductor cord and connector; steel carrying case; wrench; lubricant. Standard voltage 115, D.C. or A.C.

MODEL "77", each **$118.00**

6", 8¼", 9", 10", 12" and Groover SKIL Saws also Available

MODEL "80" SKIL DRILL

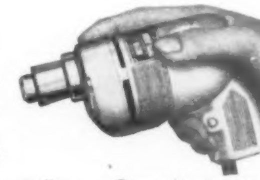
½" Standard Duty

Only 11½" long overall—3½" wide—compact, streamlined Model "80" is ideal for use in close quarter work where the usual ½" drill cannot get in. Just right for maintenance drilling. Powered for constant production work on metals. Capacity in steel, ½"; in hardwood, 1¼". No-load speed 450 R.P.M.; full load 300 R.P.M. Equipped with ½" capacity 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector; detachable pipe handle. Standard voltage 115, D.C. or A.C.

MODEL "80", each **$55.00**

MODEL "45" SKIL DRILL

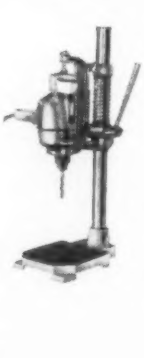
¼" Constant Duty



Puts a world of drilling power right in the palm of a man's hand . . . for fastest drilling in even the tightest spots. Only 6⅝" long. Weighs just 2¾ lbs. Ideal for aircraft, automobile, radio, cabinet and other drilling. Capacity in steel ¼"; in hardwood ½". No-load speed 1800 R.P.M.; full load 1050 R.P.M. 2500, 3500, 5000 R.P.M. no extra cost. Slow speeds 500, 750, 1000 R.P.M. $5.50 extra. Equipped with ¼" 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector. Standard voltage 115, D.C. or A.C.

MODEL "45", each **$34.00**

Space does not permit listings of all 28 SKIL Drill models, with capacities ranging from ¼" to ⅞" in steel. Whatever the portable drilling requirements, there's a SKIL Drill to do the job. See your school supplies distributor.



SKIL DRILL BENCH STANDS

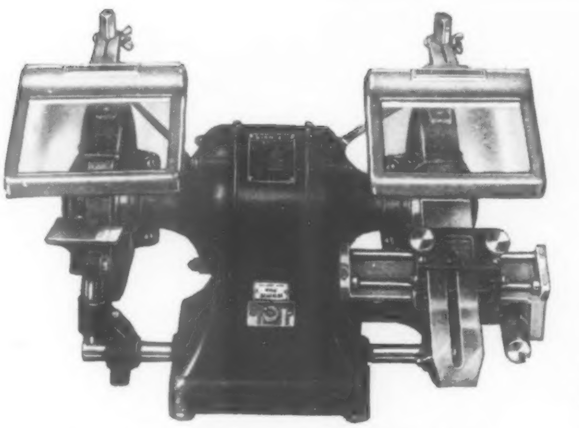
Quickly convert all SKIL Drills into stationary drill presses. For many types of work, these stands eliminate the need for costly drill presses, and permit an economical method of providing a greater number of drill presses for classroom use.

Exclusive rack and pinion gearing provides highest leverage ratios in the bench stand field. Construction is heavy and of finest materials for rugged service. There's a SKIL Drill bench stand for every current SKIL Drill, and many old models. Priced at $27.50 and $33.00.

STANLEY ELECTRIC TOOLS

EDUCATIONAL DEPARTMENT

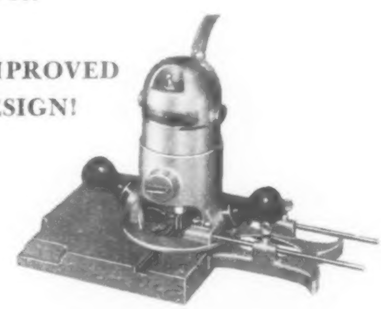
New Britain, Connecticut



No. 677 EDGE TOOL GRINDER

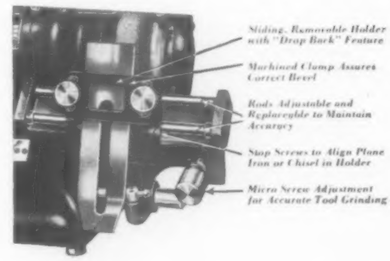
Every wood-working shop needs this improved, full ball bearing Bench Grinder. Powered by a 1/3 H.P. induction motor, fully enclosed, it operates at the correct speed for edge tool grinding. Equipped with "Flud-Lite" Eye Shields, one Adjustable Tool Rest, and the Plane Iron and Chisel Grinding Fixtures.

IMPROVED DESIGN!



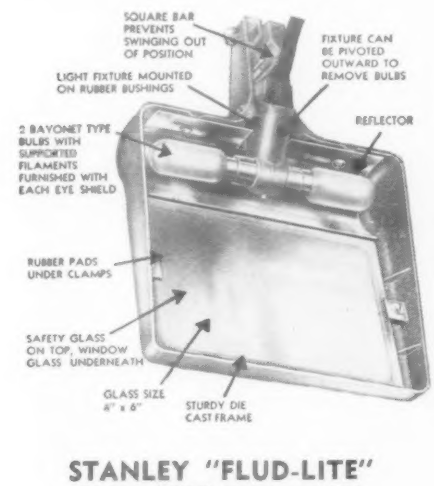
HAND ROUTER No. 10A

Fast—18,000 R.P.M.—assuring a smooth finish that makes sanding practically unnecessary. For Shaping, Inlay Work, Routing, Templet Work, Veining, Grooving, Rabbeting, Corner Beading, etc. The power unit may also be quickly attached to a Beading and Fluting unit or to a shaper table. Provides a great variety of practical cuts and a wide range of decorative operations at a very low cost.



PLANE IRON AND CHISEL GRINDING FIXTURE

Standard equipment with the No. 677 Grinder, keeps edge tools accurately beveled. Takes plane irons up to $2\frac{5}{8}$" wide and chisels of any size. Micro screw feed adjustment.



STANLEY "FLUD-LITE" EYE SHIELD No. 600

Effective eye-protection combined with better vision. Two light bulbs with reflectors floodlight work area, help prevent injuries. Adjustable up and down, and tilts to suit operator's position. Cannot be moved to non-guarding position without dismantling. Standard equipment on No. 677 Grinder, as shown above. Can be attached to all similar bench or belt-driven grinders.

BE SURE YOU HAVE THESE STANLEY CATALOGS

No. 67 STANLEY ELECTRIC TOOL CATALOG

Describes and illustrates the complete line of Stanley Electric Drills, Saws, Unishears, Grinders and other tools. Write for a copy.

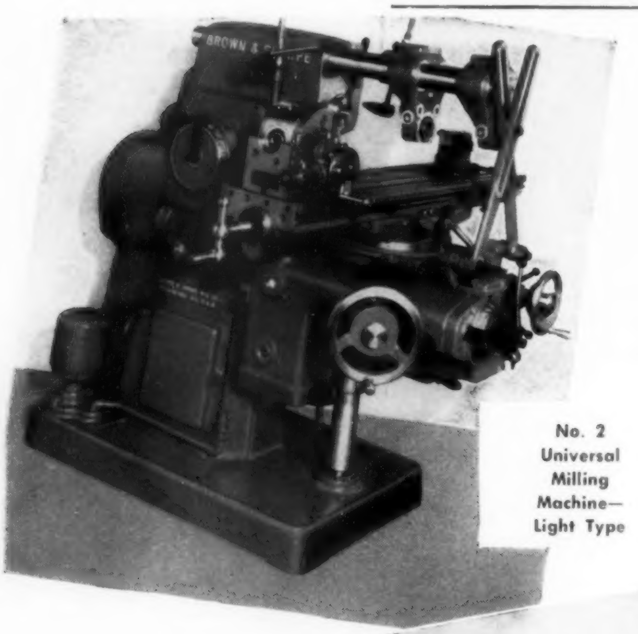
No. 607 ROUTER-SHAPER CATALOG

Describes Stanley Router-Shapers, and all the various attachments and applications. Keep a copy on hand for reference.

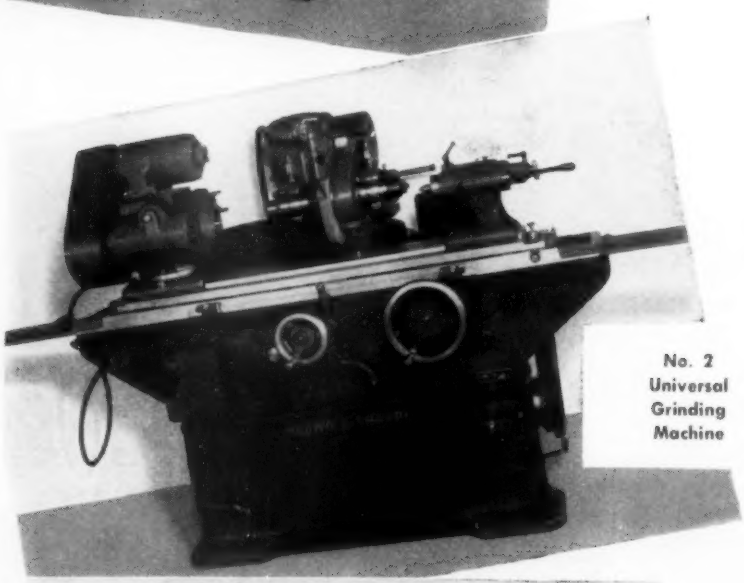
BROWN & SHARPE MFG. CO.

Providence 1, R. I.

Established in 1833



No. 2 Universal Milling Machine—Light Type



No. 2 Universal Grinding Machine

No. 1 Wire Feed Screw Machine

RELIABLE PRECISION PRODUCTS

Usage over widely varying conditions and for long periods of time has proven the superior qualities and dependability of Brown & Sharpe Machines and Tools.

MILLING MACHINES

Universal — Plain — Vertical

Ease of set-up
Handiness of operation
Wide ranges of speeds and feeds
Precision construction
Long life with minimum maintenance

GRINDING MACHINES

Universal — Plain —Surface — Tool and Cutter

Accurate and Dependable
Quickly set up
Efficient controls — Mechanical, Hydraulic and Electrical
Smooth, vibrationless operation
Many versatile attachments

SCREW MACHINES

Automatic — Wire Feed (Semi-Automatic)

High productive capacity
Accuracy of production on a wide variety of materials
Long, accurate machine life.

(See listing of Brown & Sharpe Small Tools on page 594)

BS

THE R. K. LeBLOND MACHINE TOOL CO.

Cincinnati 8, Ohio
Largest Manufacturer of a Complete Line of Lathes

for better learning

better turning

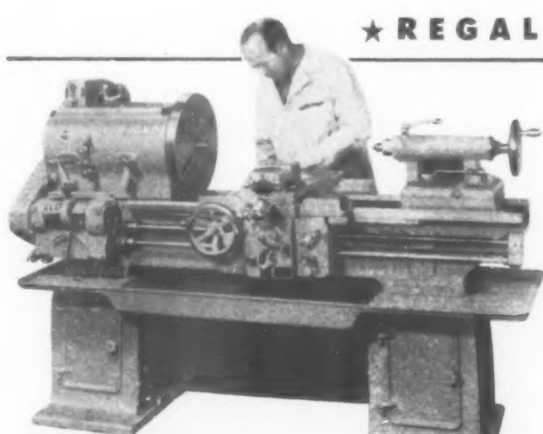
use better
"on the job"
LeBLOND LATHES

★NEW DUAL DRIVE

Get both low speeds and carbide speeds in one lathe—the new LeBlond Dual Drive.

- 12 spindle speeds: 4 high (540 to 1800 rpm); 8 low and intermediate (28 to 445 rpm).
- Single lever speed control, with direct reading plate and arrow indicator.
- Rapid Speed Selector.
- Feed box totally enclosed.
- Swing over ways . . . 15"; over compound rest . . . 9½".
- Distance between centers . . . 30" and 42". Weight, 2450 lbs., net.

★REGAL LATHE



The LeBlond Regal is preferred by schools because the same lathe is used "on the job" in industry for light work. It's the ideal training lathe.

Important Specifications:

	13"	15"	17"	19"	21"	24"
Swing over ways . . .	13½"	15¼"	17¼"	19¼"	22¼"	25¼"
Swing over compound rest	8¼"	10"	10½"	12"	13½"	17"
Distance between centers	18"	18"	30"	30"	36"	36"
Weight, net, lbs. . . .	1045	1240	1875	2560	4290	4500

Regal Lathes in sizes 13", 15", 17" (shown), 19", 21", 24".

THE R. K. LeBLOND MACHINE TOOL CO., Cincinnati 8, Ohio
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.

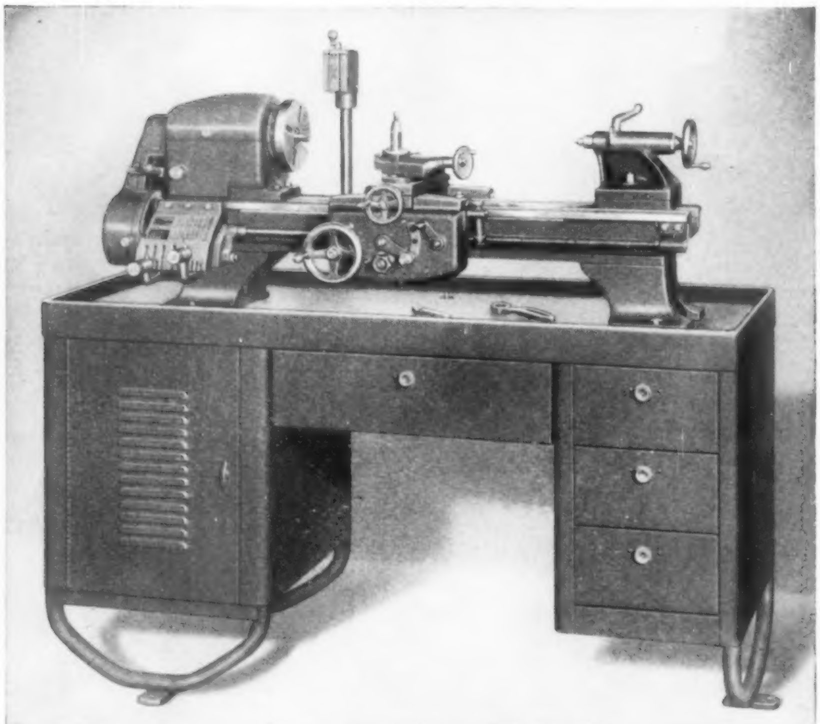
New LeBlond Electric Duplicating Device

Performs every duplicating operation with one cutting tool, and without resetting. Duplicates profile facing or work between centers within .0015" to .002". Can be installed in 10 minutes on any Regal or Dual Drive without drilling or fitting. Plug into nearest light socket and you're ready to go.

LeBLOND

LOGAN ENGINEERING COMPANY

4901 West Lawrence Avenue, Chicago 30, Ill.



No. 825. Quick Change Gear Cabinet Lathe

AS EFFECTIVE IN TRAINING AS IN PRODUCTION . . .

Logan

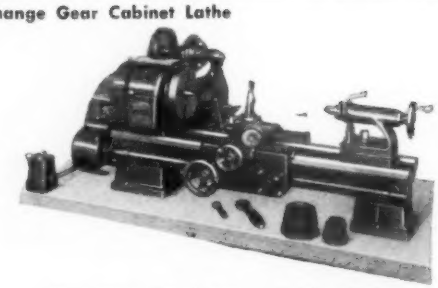
A Name To Remember

When You Think of BETTER Lathes and Shapers

Teacher and student, no less than men in industry, appreciate the lasting accuracy, versatility, safety and ruggedness of Logan Lathes. The advanced design and precise construction of these lathes explains their record of outstanding performance. Bed ways are within .0005" of parallelism. Ball bearing mounted spindles turn from 30 to 1450 rpm with no bearing adjustment. Headstock bearing faces are held to an accuracy of .0005". Self lubricating bronze bearings protect vital points of wear. Construction throughout is rugged as well as precise so that Logan accuracy and dependability are long sustained. Enclosed design on all 10" Logan Lathes is a safety factor that school authorities do not overlook. Logan economy of operation, as well as moderate initial cost, is, of course, as advantageous to schools as to industry.

Logan

Shaper



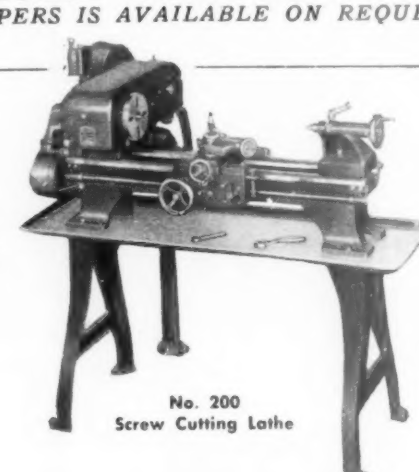
No. 400. 9-Inch Screw Cutting Lathe

CATALOG DESCRIBING ALL MODELS OF LOGAN SCREW CUTTING LATHES, TURRET LATHES, HAND SCREW MACHINES AND SHAPERS IS AVAILABLE ON REQUEST

BRIEF SPECIFICATIONS COMMON TO ALL LOGAN 10 INCH LATHES

Swing over bed, 10½" . . . center distances, 24" and 31" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 1½"-8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways and 2 flat ways.

No. 820
Quick Change Gear Lathe



No. 200
Screw Cutting Lathe

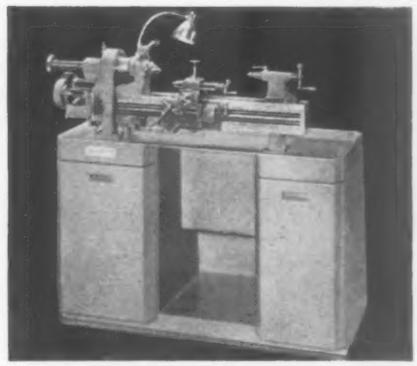
RIVETT LATHE & GRINDER, INC.

Brighton, Boston, Mass., U. S. A.

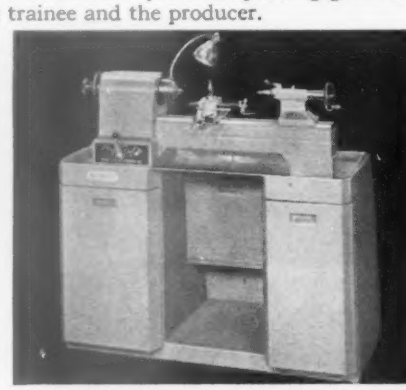
PRECISION PROVING GROUND

What tool maker or master mechanic can forget the exacting problems of his instructor — how he mastered seemingly impossible tolerances with the aid of a Rivett lathe or grinder? Many a scientist and engineer acknowledges the part these machines play in his research and new product development. Rivett is proud of their service as "precision proving grounds" for both the trainee and the producer.

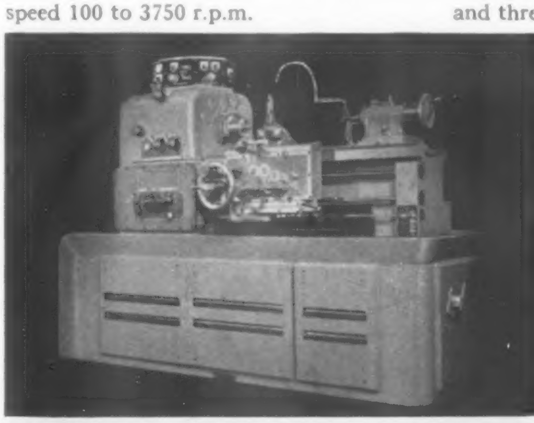
918S Cabinet Turret Lathe — 9″ swing, ⅞″ stationary collet capacity, 1⅛″ draw-in collet capacity, any spindle speed 100 to 3750 r.p.m.



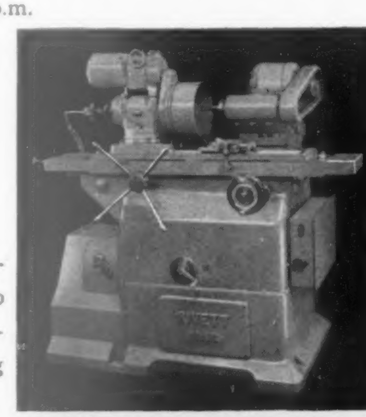
608 Precision Screw Cutting Lathe — 8½″ swing, 1″ collet capacity, 19″ center distance, power feed for turning and threading, guaranteed precision.



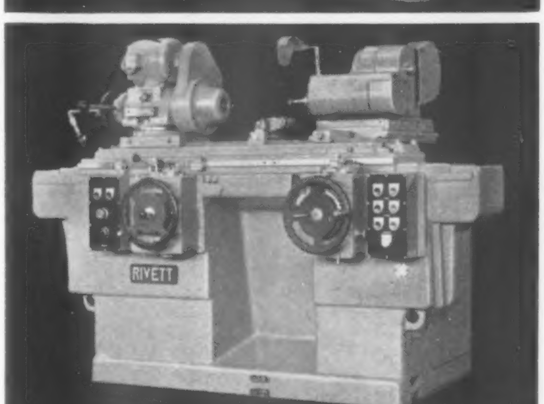
918S Precision Cabinet Lathe — 9″ swing, 1⅛″ collet capacity, 18″ center distance, any spindle speed 100 to 3750 r.p.m.



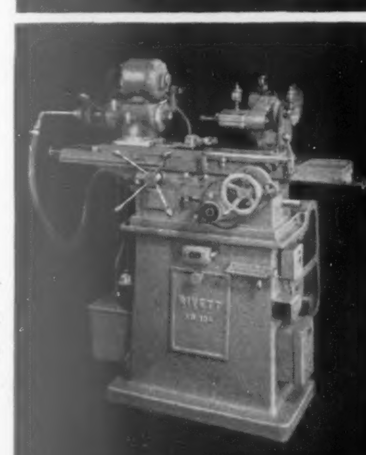
1020R Precision Toolroom Lathe — 12½″ swing, 1⅛″ collet capacity, 24″ center distance, 72 feeds and threads through gear box, any spindle speed 25 to 2500 r.p.m.



112 Universal Grinder — mechanical table reciprocation ½″ to 8″, internal grinding up to approx. 8″ dia., external grinding up to approx. 8″ dia.



1024 Hydraulic Universal Grinder — table reciprocation ⅜″ to 24″, internal grinding up to approx. 9″ dia., external grinding up to 12″ dia. by 18″ length.



104 Internal-External Grinder — mechanical table reciprocation ½″ to 4″, internal grinding up to approx. 3″ dia., external grinding up to approx. 3″ dia.

RIVETT

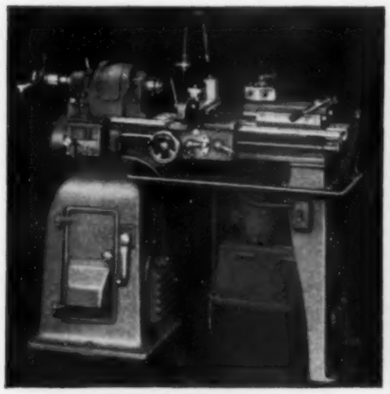
SOUTH BEND LATHE WORKS

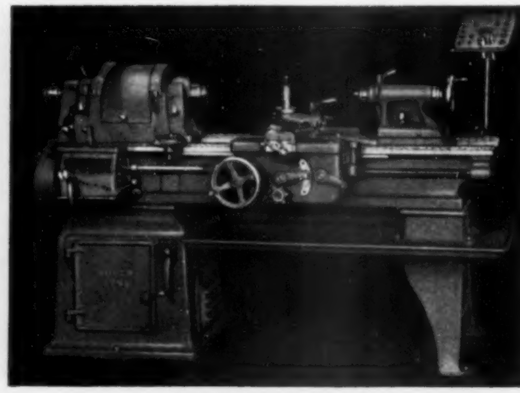
473 E. MADISON STREET SOUTH BEND 22, INDIANA

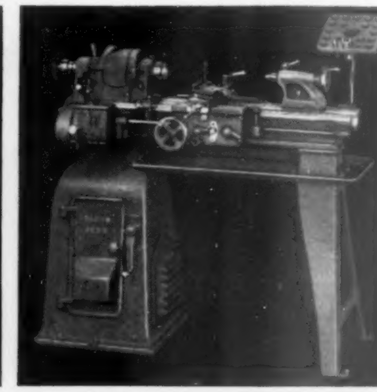
REG. U.S. PAT. OFF. & OTHER COUNTRIES

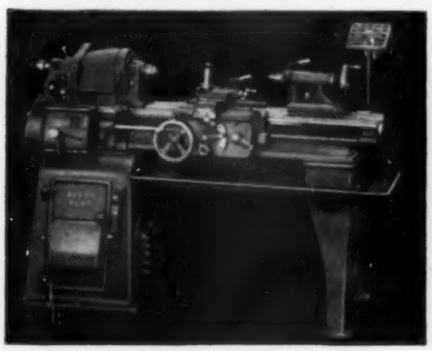
Building Better Tools Since 1906

ENGINE LATHES · TOOLROOM LATHES · TURRET LATHES · ATTACHMENTS

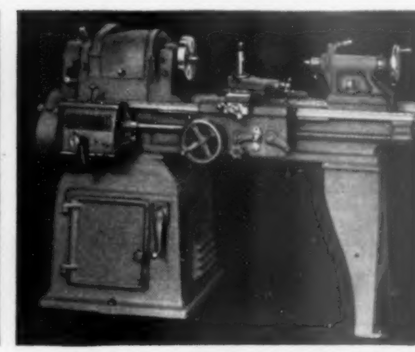

No. 1006-Z SOUTH BEND TURRET LATHE


16" x 6' SOUTH BEND TOOLROOM LATHE


10" x 3½' SOUTH BEND TOOLROOM LATHE


13" x 5' SOUTH BEND TOOLROOM LATHE


9" x 3' SOUTH BEND MODEL A BENCH LATHE


14½" x 5' SOUTH BEND ENGINE LATHE

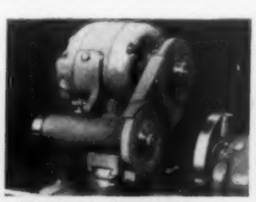
TEACHING HELPS—CATALOGS

Write for Bulletin No. 21 which describes booklets, operator's manual, movie films, wall charts, etc., available for instructional purposes.

Ask for Catalog 100-G for Lathe information, Bulletin 6496 for information on Drill Presses.

The outstanding records for performance and dependability which South Bend Precision Lathes have achieved under the critical demands of American industry recommend them for student training purposes in the school shop. Performance and dependability, plus ease of control, simplicity of operation, unfailing precision, unusual versatility, and built-in safety features, make South Bend Precision Lathes the logical installations for those school shops where the quality and thoroughness of training are principal considerations. Certainly it is to the students' advantage to learn in school to operate the lathes which they are most likely to use in industry.

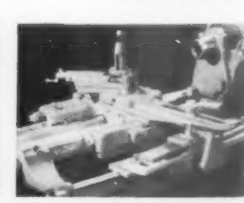

14 IN. DRILL PRESS


Electric Grinding Attachment


Draw-in Collet Attachment

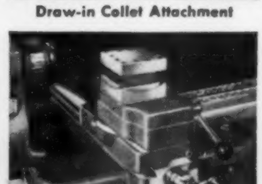

Draw-in Collet Attachment


Center and Follower Rests


Telescopic Taper Attachment


Collets and Collet Sets


Handlever Bed Turret


Square Turret Tool Block


Double Tool Cross Slide

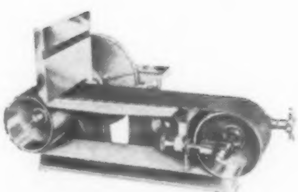

Double Tool Cross Slide

WALKER-TURNER COMPANY, INC.

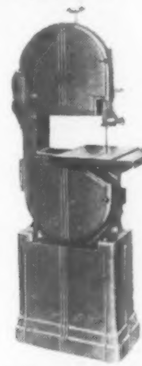
Plainfield, New Jersey

School Shop to Industrial Plant— WALKER-TURNER MACHINE TOOLS

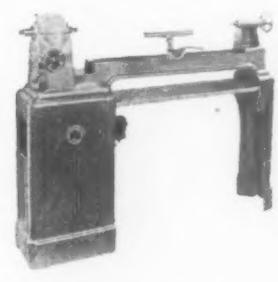
Walker-Turner Machine Tools for school shop work are the same machines used by industry wherever metals, wood or plastics are to be drilled, cut, formed or shaped. They are easy to use, safe to handle. See your nearby Walker-Turner distributor for suggestions when planning a school shop. Complete catalog on request.



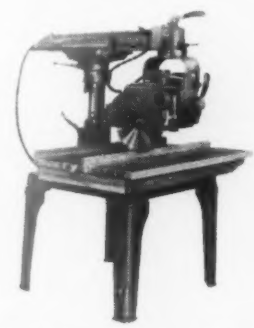
Belt and Disc Surfacer, Model SM-700. Table tilts from 90° to 45°, four ball bearings, aluminum pulleys. Sanding disc 10" diameter. Length 29"; height 16". Abrasive belt speeds 1050, 1760 and 3100 f.p.m.



14" and 16" Band Saws. Cut any material from wood or plastic to tool steel. 14" Band Saw blade speeds with standard motor—175 to 4630 s.f.m. Slo-speed motor speeds, 61 to 1950 s.f.m. 16" Band Saw blade speeds with standard motor—200 to 5300 s.f.m. Slo-speed motor speeds, 70 to 2216 s.f.m. Large work table on all models, tilts to 45°. Full safety features.

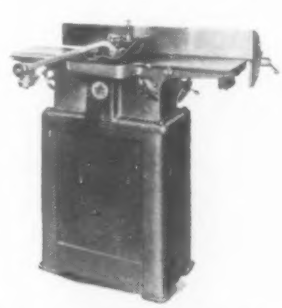


Variable Speed Lathe, Model L-1152. Swing over bed, 12"; over gap 15". 38" between centers. Provision for outboard face-plate work. Speeds: 2" pulley, 240 to 2000 r.p.m. With 4" pulley, 460 to 3750 r.p.m. with 1750 r.p.m. motor.



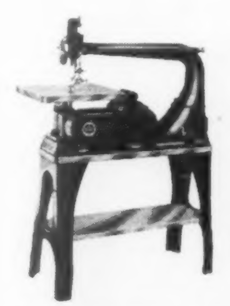
Radial Saw, Model RA-1107. Gliding ram travels 21½", rips material 38" wide. 12" blade cuts 4¼" deep. Universal head tilts for any angle, bevel, miter, dado or compound cut—also shaping, tenoning and routing. Change to abrasive wheel, converts for friction metal cutting. 2 or 3 h.p. motors. Double safety anti-kickbacks.

15" Drill Press, Bench Model D-950. Drills to center of 15" circle. 4 ball bearings. 4¼" spindle travel. Speeds 600 to 5000 r.p.m. Capacity ½".



6" Jointer, Model P-910. Rabbets to ½", planes ribbon thin. Accurate depth gage and miter gage. Adjustable fence 29½" long, 4½" high. Stops provided at 45° and 90° positions. Speed: 4200 r.p.m. Full protection safety guards.

10" Tilting Arbor Saw, Model TA-1180 B. Cuts to depth of 3", angle cuts to 45°, accurate self-indexing miter gage. All-over safety features.



Jig Saw, Model J-1915. Large table area, 16" x 12¾", tilts to 45°, quadrant indicator. Vise to table 2¾" with 6" blade. Throat capacity 24"; arm removable for large work. Four speeds: 600, 900, 1250 and 1740 r.p.m.

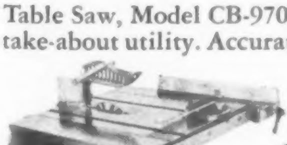


Table Saw, Model CB-970. Sufficiently light for take-about utility. Accurate blade tilt controlled by hand crank. Capacities: 8" saw, 2½" cut; 9" saw, 3" cut. Accommodates 6" dado. Motors recommended: 8" blade, ½ h.p.; 9" blade, 1 h.p.—3450 r.p.m. motors.

walker-turner MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED
RADIAL DRILLS • RADIAL SAWS
BAND SAWS—FOR WOOD OR METAL
RADIAL METAL CUT-OFF MACHINES • MOTORS

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS

4020

STANDARD PRESSED STEEL CO.

OVER 45 YEARS IN BUSINESS

Jenkintown, Penna., Box 15

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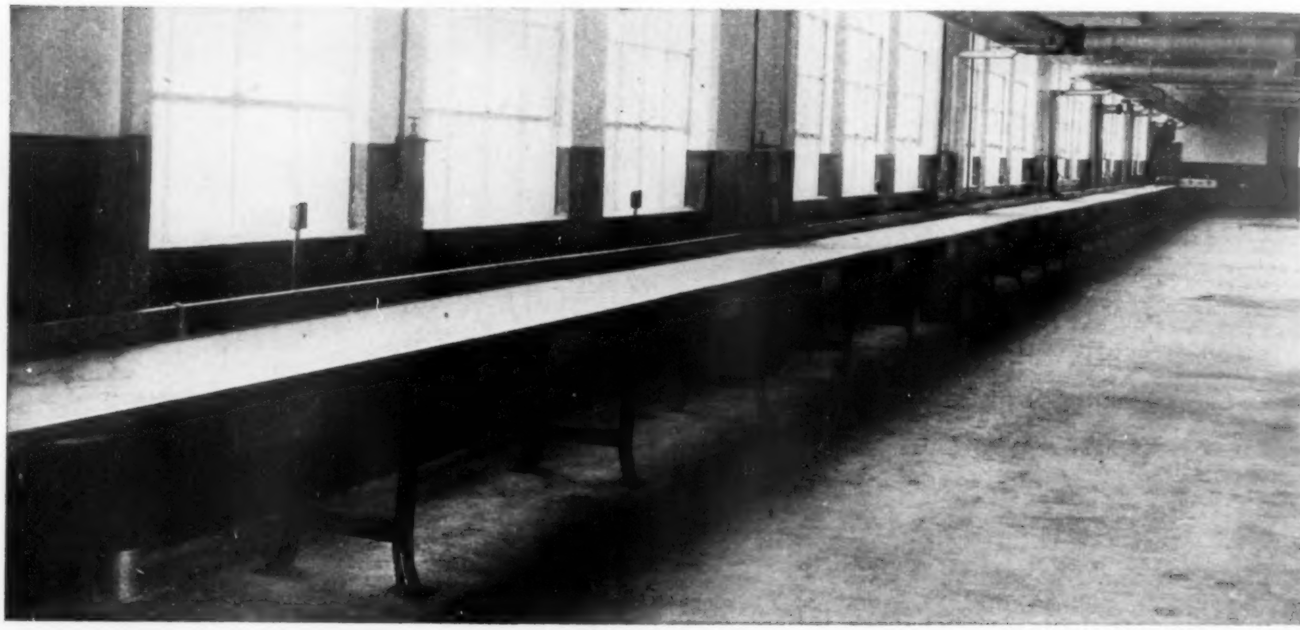


Fig. 200 M.H.B.

HALLOWELL

SHOP EQUIPMENT OF STEEL

Fig. 1729

...designed for *utility, convenience and comfort*
...built for *long service, and hard wear*

Fig. 2207

The most exacting requirements of school and university can be filled easily with "Hallowell" Shop Equipment of Steel. This Equipment comprises: work-benches, stools, chairs, supervisor's desks, and tool cabinets—in a wide variety of styles and sizes—built of sturdy, hard-wearing steel,—welded at the joints—a construction that has made "Hallowell" a *buy word*.

Fig. 200 M

FIG. 732
Pat'd and Pats. pending
Drawer is extra

Write for your copy of the "Hallowell" Catalog. It's a handy reference when you order your Shop Equipment of Steel.

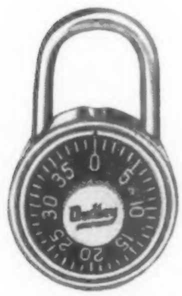
DUDLEY LOCK CORPORATION

Chicago 6, Illinois

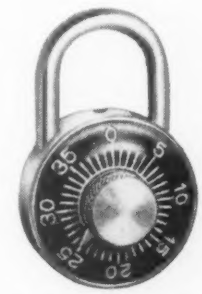
AS THE PIONEER in the use of combination padlocks for schools, Dudley has developed a type of locking equipment that has resulted in a simplified easy control, trouble-free locker system operation. Dudley locks are used by the majority of schools because they give extra service, extra protection and extra value.

SPECIFY DUDLEY

Dudley masterkeyed locks are made with exclusive Bell-type pin tumbler, pick-resistant cylinder. The famous Bell Key affords greater protection against duplication because it is not made on the commercial key making machine.

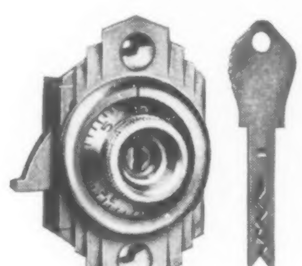


RD-2 ROTODIAL. A strong durable lock for lockers, scientifically tested, eliminates pilferage, is tool-proof, locks automatically disarranging all tumblers and dial.



RP-5 ROTOPOINT. A sturdily constructed lock for lockers. Locks when shackle is pushed into the lock case, disarranging all tumblers.

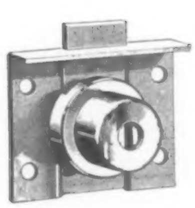
★



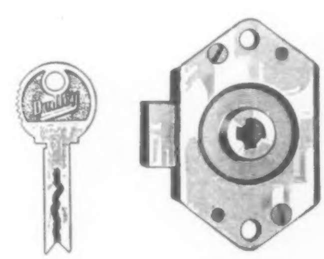
S-540. Masterkeyed combination lock for lockers with automatic latch release. Locks automatically disarranging tumblers and dial. Combination instantly changed with special reset key without removing any part of lock from locker.

P-570. Self-locking. Tumblers and dial disarranged on opening and dial moved to a new position. Masterkeyed alone or in the same series as other Dudley masterkeyed locks.

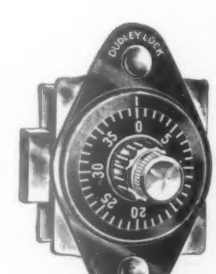
★



W-510. Key lock for wood drawers and cabinets 7/8" and 1 1/8" thickness. Keyed different or alike. Masterkeyed alone or in same series with other Dudley masterkeyed locks.



S-530. Key lock for lockers and steel cabinets. Keyed different or alike. Masterkeyed alone or in same series with other Dudley masterkeyed locks.
S-535. Similar to S-530 but with bevel spring bolt.



L-4. Combination lock with square dead bolt for lockers without automatic latch release. Combination readily changed.

Different types of masterkeyed locks—S-540, P-570, S-530, W-510—used on different kinds of equipment in the same department can be furnished under the same master, if desired, simplifying supervision and control.

Dudley Keyless Lock

Dudley representatives are lock specialists experienced in the school lock field. They are competent to make a survey of the locking requirements and to recommend a system that will meet your needs. **Write us today!**

NATIONAL LOCK COMPANY

Rockford, Illinois

BRANCH OFFICES

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Martinsville, Va.
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New York
Portland
Rochester

St. Louis
St. Paul
San Francisco
Syracuse
Winnipeg, Man.
York, Pa.
Toronto, Ont.

ROCKFORD COMBINATION LOCKER LOCKS are made for standard Steel Lockers of any style or make. It is the complete line assuring the utmost in security, convenience, simplicity and durability. Rockford Locks have proven their worth in hundreds of Educational Institutions. For simplified and complete supervision and control select the Rockford Line.

NO. 68-267

Master Keyed Combination Self Locking, for use on Lockers having spring latch bar. Over 10,000 different combinations available. No bolt or rivet heads visible from outside. Can also be furnished without Master Key feature.

NO. 68-269

For use on Box type Lockers having no latch bar. Lock has beveled spring bolt. Closing door locks lock and spins dial concealing last figure of combination. Furnished with or without Master Key feature.

NO. 68-271

Master Keyed Combination Dead Bolt Lock having square end dead bolt. Lock does not have self-locking feature. Combinations of this lock and Nos. 68-267 and 68-269 can easily be changed by removing escutcheon plate and turning dial.

COMBINATION SHACKLE LOCKS

NO. 68-265

Keyless Combination Self-locking Shackle Lock that is fool proof, secure and durable. Inserting shackle upsets combination by turning dial. Must be completely re-dialed to open. Over 8,000 different combinations available. This is a very popular lock in the Rockford Line. Lock case is Chromium Plated and dial is black with white figures.

Master Keyed for ease and convenience of supervision. Can be Master Keyed with all built-in Locks shown above, or Laboratory Lock shown below. Students operate lock by combinations, while officials gain access by use of Master Key. Dial is locked against rotation when shackle is open.

NO. 68-264

NO. 68-253

VOCATIONAL AND LABORATORY EQUIPMENT LOCK

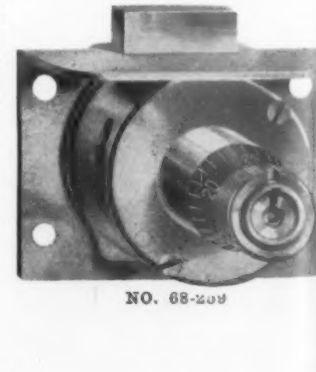
This Lock was designed for use on Vocational and Laboratory Furniture. It is of heavy solid brass construction to withstand hard usage and acid fumes. It is available with master key or sub-master key features, if desired. Half mortise application for either right or left hand doors or for drawers.

NO. 68-253

NO. 68-259

COMBINATION DRAWER LOCK

Combination Master Keyed Laboratory Drawer or Door Lock. Combination can quickly be changed without removing lock from mortise. Lock is of Solid Brass construction and is not affected by ordinary Laboratory fumes and acids. Lock is reversible for use on right or left hand doors.



NO. 68-259

[Illustrated here are only a few of the many School Locks available in the Rockford Line. Ask for illustrated folder showing complete line.]

THE YALE & TOWNE MFG. CO.

Stamford, Conn.

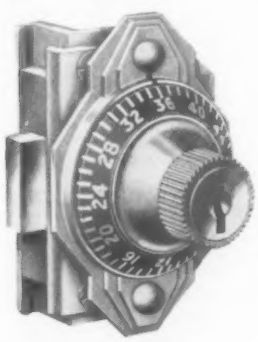
Maximum security—the most protection, dollar for dollar. *Maximum efficiency*—quick, easy operation reduces congestion in locker rooms.

TRADE **YALE** MARK

YALE COMBINATION LOCKER LOCKS

Exclusive YALE Features

Maximum Security. Combination dialed on three positive numbers. Combination must be known and cannot be found by manipulating dial. *Combination Disperser* automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering. *Combination Changeable* with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks. *Supervisory Control* of a group of lockers or the collective groups of a city school system obtained by the *Yale Emergency Key Control.* The key used is assigned exclusively to these locks.



Lockers with Automatic Bolt Release

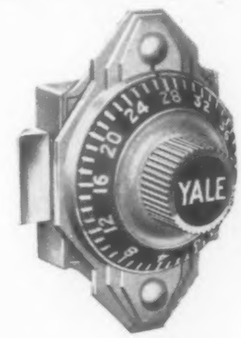
New locking principle — automatic self-locking vertical sliding bolt

Emergency Key Controlled

No. L3374-CM, Cadmium finish
No. L3374-DZ, Chromium finish

Dial Operated Only

No. L3364-CM, Cadmium finish
No. L3364-DZ, Chromium finish



Steel Compartment and Box Type Lockers

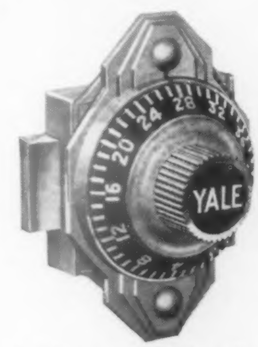
Beveled spring-bolt, automatic self-locking

Dial Operated Only

No. L3369-CM, Cadmium finish
No. L3369-DZ, Chromium finish

Emergency Key Controlled

No. L3379-CM, Cadmium finish
No. L3379-DZ, Chromium finish



Lockers with Gravity Type Locking Device

Dead bolt manually operated

Dial Operated Only

No. L3368-CM, Cadmium finish
No. L3368-DZ, Chromium finish

Emergency Key Controlled

No. L3378-CM, Cadmium finish
No. L3378-DZ, Chromium finish

NEW YALE COMBINATION PADLOCKS

Strong construction Rustless metal case, cadmium-plated steel shackle. *Easy operation.* Dialling three numbers and turning knob to right causes shackle to jump open automatically. Pushing the shackle in automatically deadlocks the bolt and automatically disperses the combination.

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

With Emergency Control Key

589 Combination Padlock—Emergency Control Key operates all locks in set. $\frac{1}{4}''$ shackle. 20,000 combinations—more to order. *579 Combination Padlock* is same, without Emergency Control Key.

Dial Operated Only

515 Combination Padlock — Excellent quality at moderate cost. $\frac{1}{2}''$ steel shackle. 10,000 combinations —more to special order.

BERGER MANUFACTURING DIVISION

OFFICES IN PRINCIPAL CITIES
Baltimore Chicago Dallas
Birmingham Cincinnati Denver
Boston Cleveland Detroit
Buffalo Columbus Indianapolis

REPUBLIC STEEL CORPORATION
Canton 5, Ohio
EXPORT DEPT., CHRYSLER BLDG., NEW YORK

OFFICES IN PRINCIPAL CITIES
Kansas City Oakland
Los Angeles Philadelphia
Milwaukee Pittsburgh
Minneapolis Portland, Ore.
New Orleans St. Louis
New York City Salt Lake City

STEEL LOCKERS **OFFICE EQUIPMENT** **STORAGE SHELVING** **SHOP EQUIPMENT**

Berger Steel Equipment is manufactured by an organization with sixty-two years' experience in making equipment for the modern school and university. Berger equipment is built to meet the most rigid requirements for durability, utility and structural perfection. All items are quickly available in practically every size and type. Experienced Berger engineers will be sent anywhere without charge to assist architects, builders or purchasing agents in planning new installations.

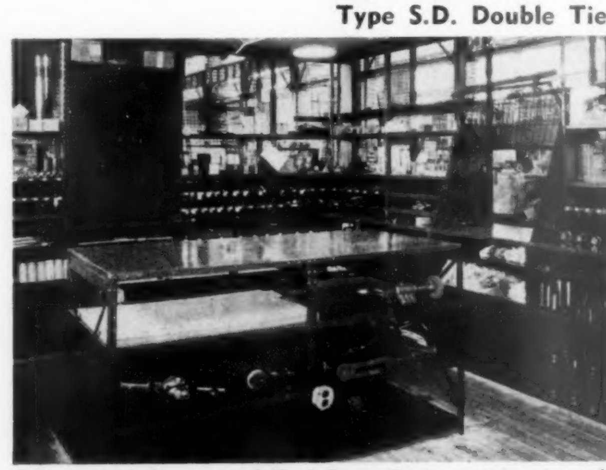
The single tier standard louvre is the most popular general purpose locker

A double tier standard louvre locker. Send for Catalog No. EL-561

Type S.S. Single Tier

Type S.D. Double Tier

Berger Classroom Wardrobes provide for efficient handling of pupils' clothing. Send for Catalog No. EW-566



Berger Steel Storage and Tool Room Equipment has been designed by engineers qualified by years of experience with storage problems

Steel Shelving can be furnished to fit any storage problem. Send for Catalogs No. ES-580 and ES-584

Berger Open Type Shelving

Work Bench

Berger benches are available in many combinations. Send for Bulletin No. ET-587

When many small items must be stored and protected, Berger Flexi-Bilt units offer many advantages not found in any other type of construction. Send for Catalog No. ET-587

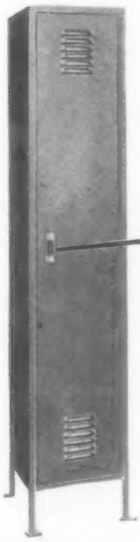
Flexi-Bilt Units

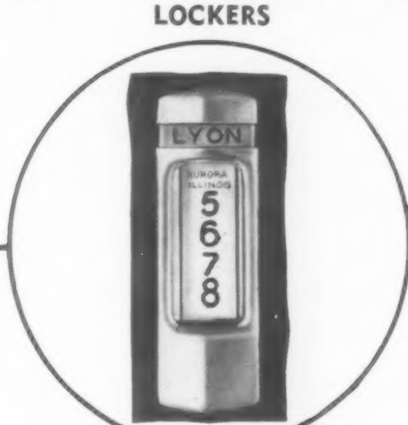
LYON METAL PRODUCTS, INCORPORATED

1334 Madison
Aurora, Illinois

LYON STEEL SCHOOL EQUIPMENT

LOCKERS





Lyon lockers offer the utmost in efficiency, design, durability and attractiveness. The rigid bulb edge frame adds strength and the vertical and horizontal members are rabbetted and welded. All hinges are projection welded to the frame. The butt of the hinge is recessed in the door frame and therefore the pin cannot be forced out. However, the doors may be removed and replaced with ease and still retain perfect alignment. Rubber cushions eliminate metallic sound.

All Lyon single and double tier lockers are equipped with the modern recessed handle—unmatched for modern appearance and design. Handle has no protruding parts to snag clothing and the number plate is recessed right in handle. Full length prelocking bar assures finger tip control.

SINGLE-TIER

Most practical and widely used of all lockers. For full length clothing storage. Available in wide range of sizes.

DOUBLE-TIER

Double-tier lockers are economical on cost and storage area. Particularly satisfactory for short period occupancy and where long coats are not worn. In a wide range of sizes.

CABINETS

Storage and Wardrobe Cabinets

Lyon steel cabinets in three models — storage (illustrated) wardrobe and combination. No bolt heads on front or sides and the fully rounded corners give Lyon cabinets a modern styling and appearance. Double doors swing open to full 180 degrees. Shelves in storage and combination models are adjustable every 2" without the use of tools. Polished chrome handles and built-in lock.

LYON STEEL FOLDING CHAIRS

Four models of folding chairs — plain steel, metal cane, pressed wood seat with steel back and fully upholstered.

Variety of colors and color combinations. Two heights—standard folding chair and 18" dining room height.

Wide, deep curved seat accommodates largest person. Curved back is tailored to fit conformation of body.

Live, rubber feet prevent slipping. Accessory items include tablet arms and ganging equipment.

BENCHES

Lyon wood working benches allow systematic storage of tools right on the job and eliminates store room congestion. Top is 1¾" thick maple with natural finish. Furnished in single and double face models.

A COMPLETE LINE OF

Work benches	Welding benches
Tool stands	Tool cabinets
Shop boxes	Conveyors
Tool boxes	Shelving
Bar racks	Filing cabinets
Stools	Shop desks

Tool storage equipment

DRAWING TABLE

For engineering, art and drawing classes. Designed to accommodate a student in each of four classes per day. Each student has separated locker. Table has smooth steel top and is flanged to hold drawing board in place. Top is adjustable.

FRED MEDART PRODUCTS, INC.

Potomac and DeKalb Streets
Saint Louis, Mo.
ENGINEERING AND SALES SERVICE IN ALL PRINCIPAL CITIES

MEDART STEEL LOCKERS

LOCKER CONSTRUCTION

Design—Built on "unit principle" each locker having its individual door, frame, top, bottom, etc., all parts interchangeable.

Doors—Made of 16-gauge steel, reinforced by flanging top and bottom edges, and channelling side edges.

Frames—Made of 16-gauge steel, formed into channel shape with rolled inner edge. Upright and cross members electrically welded together, making a true, square and rigid frame.

Body of Locker—The backs, sides, tops and bottoms are made of 24-gauge steel.

Locking Device—Three-point rubber-cushioned contact in single-tier lockers; two-point contact in double-tier lockers. Doors are pre-locking self-latching type.

Door Handle—Lift type with concealed padlock eye.

Locks—As selected from Catalog.

Hinges—36- and 42-in. doors hung on two hinges; 60-in. doors on three hinges; 72-in. doors on four hinges. Hinges electrically spot-welded to frame and bolted to side flange of door with two bolts. Bolts equipped with lock washers.

Legs—Adjustable front legs to overcome floor irregularities. According to width of lockers and grouping, legs are spaced 30 to 36 in. apart with a clearance of 4⅞ in. above floor.

Cabinet Base—An extra 4⅞-in. cabinet base can be furnished at an additional charge.

Ventilation—All standard locker doors are louvred at top and bottom to provide ventilation—three louvres top and bottom for 36- and 42-in. lockers, six louvres top and bottom for 60-in. lockers and nine for 72-in. lockers. Box lockers, three louvres. (Round hole perforations can be substituted for louvres at no additional cost.)

Standard Finish—School Furniture Brown, or Olive Green. All parts are thoroughly cleaned before enameling; enamel is baked on to hard finish.

Hooks—Made of steel, cadmium plated. Lockers 12 and 15 in. deep have three single-prong wall hooks and one double-prong ceiling hook; lockers 18 in. or more in depth have five single-prong wall hooks.

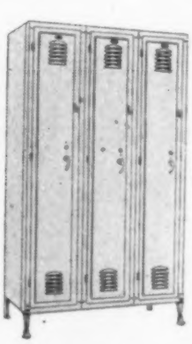
Coat Rods—Standard equipment on all lockers 18 in. or more in depth and on all two-person lockers.

Shelves—Single-tier lockers have shelves extending the full depth and width of lockers. Shelves have rolled front edge and are bolted to sides. Double-tier lockers do not have shelves. Extra shelves can be provided.

Tops—All lockers have individual flat tops. Sloping tops can be furnished at extra cost.

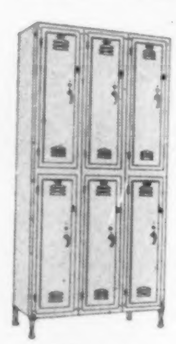
Numbering—All lockers are furnished with aluminum number plates to be bolted in place. Unless otherwise specified lockers are numbered consecutively from "one" up.

LOCKER SIZES



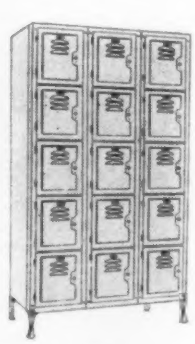
Single Tier Lockers

Wdth.	Dpth.	Hght.
12"	12"	60"
12"	15"	60"
12"	18"	60"
15"	15"	60"
15"	18"	60"
12"	12"	72"
12"	15"	72"
12"	18"	72"
15"	15"	72"
15"	18"	72"
18"	18"	72"
18"	21"	72"



Double Tier Lockers

Wdth.	Dpth.	Hght.
12"	12"	30"
12"	12"	36"
12"	15"	36"
12"	18"	36"
15"	15"	36"
12"	12"	42"
12"	15"	42"
15"	15"	42"



Box Lockers

Wdth.	Dpth.	Hght.	Tiers
12"	12"	12"	5
12"	12"	12"	6
12"	15"	12"	5
12"	15"	12"	6
15"	15"	12"	5
15"	15"	15"	4

Also Gym Suit Lockers and Two-Person Lockers

To quote prices we must have the following information: Number of lockers of each size, number that are single row (wall type), number that are double row (back to back), number to be recessed and amount of trim required, color, catalog number of locks desired, and point of delivery.

SHELVING FOR WIRE BASKETS

Illustration shows a section of wire basket shelving seven baskets high (6 ft. 0 in.) with basket dividers and padlocking arrangement for self-service. Shelving sections nine baskets high (7 ft. 6½ in.) for use in attendants' rooms can also be furnished.

A section for either 13 x 9 x 8-in. or 13 x 12 x 8-in. baskets is 40 in. long and 13¾ in. deep, accommodating four small or three large baskets to each shelf. This shelving is of rigid open construction, providing maximum ventilation for baskets. Dividers as shown in illustration are standard equipment. An aluminum number plate for each basket space is provided. Finished in School Furniture Brown, or Olive Green Enamel.

Also: Trucks for Wire Baskets—made up of two standard steel shelving sections bolted back-to-back, cross-braced for rigidity, and with anti-friction steel rollers.

WIRE BASKETS

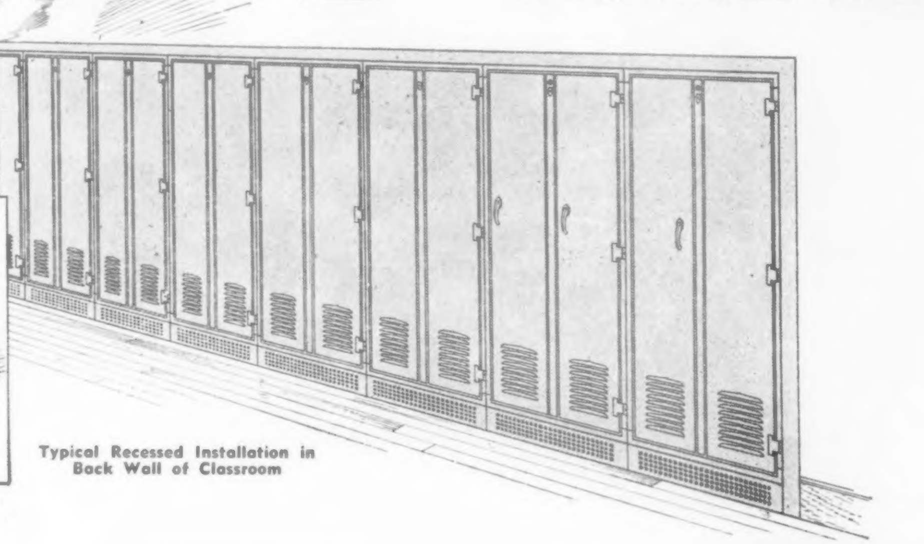
Body of 15-ga. wire, with 6-ga. top frame and 13-ga. corners. "X" braced bottom; aluminum number plate. Two sizes in both standard 1" and special ¾" mesh: 13 x 9 x 8" and 13 x 12 x 8".

MEDART LOCKEROBES

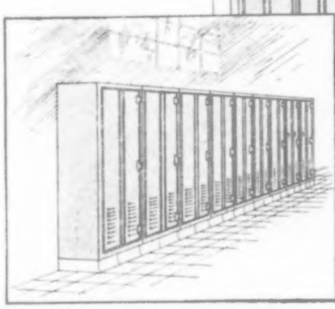
A Lockerobe classroom assembly consists of a multiple of pupil units, each unit having one pair of doors. All doors are opened or closed by one person (teacher or monitor) from one point. The right hand door of control unit operates all right hand doors; the left hand control unit door operates all left hand doors, thus eliminating any need for children of elementary school age to operate the doors of the individual units. School officials approve this feature which eliminates possibility of injury, noise and confusion in the classroom and needless delay, in bringing the class to order, or upon dismissal. A simple door operating mechanism eliminates future maintenance problems.

Constructed entirely of steel, the Lockerobe is sanitary, fire-resisting, termite-proof, and easy to keep clean. When recessed, Lockerobes require a recess depth of only 16 in. This dimension when contrasted to depth required by conventional type wardrobes represents an unusual opportunity to reduce classroom cubage and cut building costs. Lockerobes also serve as an important adjunct to room ventilation systems. Air can be withdrawn through grille base and after passing between back of units and recess wall, can be expelled through conventional exhaust fan or duct.

The Lockerobe is a complete, self-contained assembly with all parts finished at factory and interchangeable. Various interior arrangements for the storage of pupils' clothing, books, etc., are available.



Typical Recessed Installation in Back Wall of Classroom



Typical Free-Standing (Non-recessed) Installation with Standard Flat Top

Special sloping top may be had if desired

Lockerobe Auxiliary Units

Bookcases, Teachers' Wardrobes and Combination Bookcases and Wardrobes furnished in 22-in. widths. To determine over-all length of classroom assembly and of recess required, where one or more auxiliary units are required, add the actual width of auxiliary units to the above pupil unit and recess dimensions.

Number of 22-in. Pupil Units required	Over-all length of assembly	Length of recess required
2	3 ft. 8 in.	3 ft. 11 in.
3	5 ft. 6 in.	5 ft. 9 in.
4	7 ft. 4 in.	7 ft. 7 in.
5	9 ft. 2 in.	9 ft. 5 in.
6	11 ft. 0 in.	11 ft. 3 in.
7	12 ft. 10 in.	13 ft. 1 in.
8	14 ft. 8 in.	14 ft. 11 in.
9	16 ft. 6 in.	16 ft. 9 in.
10	18 ft. 4 in.	18 ft. 7 in.

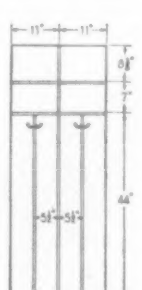
Each 22-in. pupil unit will accommodate 4, 5, or 6 pupils, depending on the interior arrangement selected. (See below.)

MEDART ENGINEERING SERVICE

A competent staff of Medart engineers is available to help you plan and lay out the most efficient and economical installation of equipment to meet your own special requirements. No obligation.

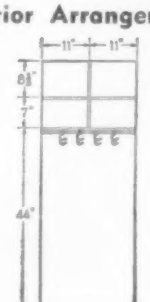
MEDART CATALOGS WILL BE FURNISHED UPON REQUEST

Interior Arrangements



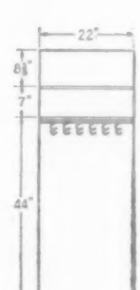
Interior "A"

Each unit accommodates 4 pupils. Provides 4 individual hat compartments and 4 individually partitioned coat compartments.



Interior "C"

Each unit accommodates 4 pupils. Provides 4 individual hat compartments, coat rod and 4 sliding double-prong coat hooks.



Interior "D"

Each unit accommodates 6 pupils. Provides 2 full width shelves, coat rod, and 6 sliding double-prong coat hooks.

PENN METAL CORPORATION OF PENNA.

48 Oregon Avenue, Philadelphia 48, Pa.

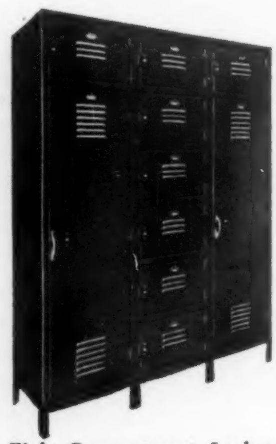
IN BUSINESS CONTINUOUSLY SINCE 1869

1869 Penco

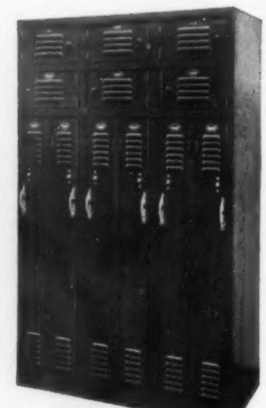
STEEL LOCKERS -- STORAGE and WARDROBE CABINETS
STEEL SHELVING -- TOOL UNITS -- METAL SPECIALTIES

Single Tier Locker Type 50-U-2

Box Lockers Type 40



Eight-Compartment Locker Type 82



Two-Person Lockers Type 734

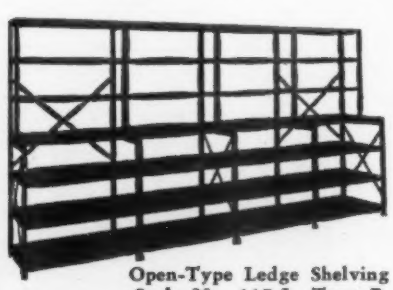
Wardrobe Cabinet Type 3618-W

STEEL LOCKERS

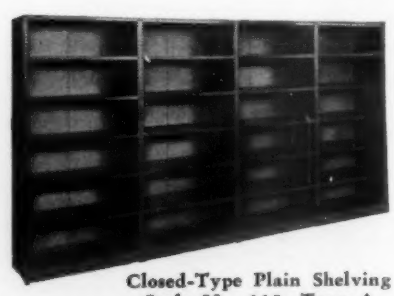
Penco single tier, double tier, box and multiple lockers of various types provide the complete storage facilities needed by all schools. Catalog No. 46 contains specifications, construction details and space-saving suggestions. Write for your copy.

STEEL CABINETS

Manufactured in many styles and sizes for wardrobe, storage or combination use.



Open-Type Ledge Shelving Style No. 117-L, Type B



Closed-Type Plain Shelving Style No. 118, Type A

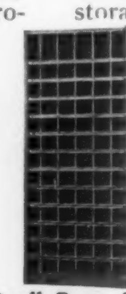
Closed-Type Ledge Shelving Style No. 119-L, Type A

STEEL SHELVING

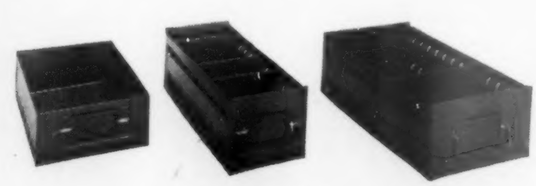
There are six basic types of Penco Steel Shelving which, with readily added accessories, provide protection and security for any commodity that requires storage. Catalog No. 45 contains detailed specifications and construction details. Write for your copy.

Steel Table No. 651

Steel Counter No. 652



Small Parts Unit No. 154



Special Steel Boxes

Many prominent schools, clubs and industrial plants have been equipped with **Penco Standard Products** which are specified by architects for their durability and high standard of workmanship. They are known throughout the trade as the best that money can buy.

Write for the complete Penco Catalogs or see Sweet's Catalog for specifications.

STANDARD STEEL EQUIPMENT CO., INC.

Dept. A-1, 117-20 Fourteenth Road, College Point, L. I., N. Y.

PARTS BINS

87" x 36" x 12" (Above). With inter-changeable units. Openings arranged to your specifications. Write for separate circular and easy to order form.

Style 18SP

SMALL PARTS CABINETS

13" x 36" x 12" with 18 generous drawers. Every drawer and drawer-divider (2 to a drawer) has its own individual label holder. Ideal for small parts needed close at hand!

COUNTER HIGH CABINET

Two adjustable shelves in this low-priced 42" x 34" x 18" steel cabinet. Counter surface more than 4 sq. ft. *Style 2CH*

SLIM JIM UTILITY CABINET

Wardrobe, Style 24WA
Storage, Style 24ST

Ideal for narrow spaces, measures 72" x 24" x 18". There's 10 feet of shelf space in 24ST, or plenty of room for clothes in 24WA. Both styles easily interchangeable.

Style #4ST

STORAGE CABINETS

With 4 adjustable shelves. Provides protection against dust and moisture, fire and theft hazards. The best and safest way to store school supplies for immediate use and frequent checking of stock. Sturdily made, smartly finished. Extra shelves available.

Style #1WA

WARDROBE CABINETS

For safe and dust-free protection of clothing. Complete with adjustable hat shelf and hanger rod. Saves wear and tear on clothes and keeps them neatly put-away at all times. All Storage, Wardrobe and Combination Cabinets have three-point locking device furnished with two keys.

Style #3CW

WARDROBE & STORAGE CABINET

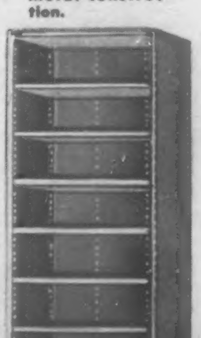
Provides maximum space in minimum floor area. Consists of Hat Shelf, Coat Compartment with Hanger Rod and 3 adjustable Storage Shelves. Especially designed for faculty staff members. Extra shelves available.

Either of these two cabinets may be changed into the other with inexpensive parts which you may order.

Style #1DC

Desk High CABINETS

Permits maximum useability with generous storage space and large flat top for telephone, desk files or typewriter. All metal construction.

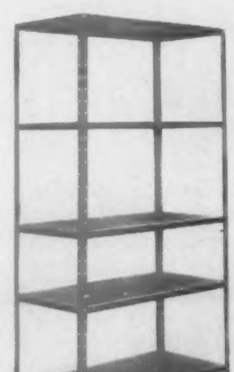


SHELVING

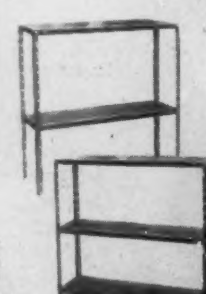
For every purpose. Standard Shelving Units are used in many schools and universities throughout the country. Whatever your requirements may be consult with our engineers for the perfect solution to your particular shelving problem.

SINGLE TIER LOCKERS

Built for safety, privacy, cleanliness and economy. Available in many types and sizes. Strongly constructed with rigid angle steel frames, sturdy hinges, secure locking device, attractive handles and rust-resistant baked enamel finish. Illustrated are Single Tier Lockers 3 or more wide, 12x18x78" including 6" legs.



3-IN-1 UTILITY SHELVES



The most flexible utility shelving unit made. Can be set up as a single unit 67" high, or as two separate units each 36" high for use as tables, laboratory benches and book cases. Units are 36" wide and can be easily assembled.

Standard Steel Equipment is Standard for Every Use.

STANDARD STEEL EQUIPMENT CO., INC.

Write Today for Circular and Quotations on Your Specific Needs.

MATHIESON CHEMICAL CORPORATION*

60 East 42nd Street, New York 17, N. Y.

PLANTS

Niagara Falls, N. Y., Saltville, Va., and Lake Charles, La.

BRANCH OFFICES

Charlotte 2, N. C., Liberty Life Bldg.
Chicago 11, Ill., 410 N. Michigan Ave.
Cincinnati 2, Ohio, Dixie Terminal Bldg.
Houston 2, Tex., 2nd National Bank Bldg.
New Orleans 12, La., Queen and Crescent Bldg.
Philadelphia 7, Pa., Widener Bldg.
Providence 3, R. I., Hospital Trust Bldg.
St. Louis 1, Mo., Paul Brown Bldg.

PRODUCTS

Sanitation H T H (Concentrated Hypochlorite)
H T H Bleach
H T H-15 (Germicide)
Lo-Bax (Bactericide)
Aqua Ammonia—26°
PH-Plus (Fused Alkali)
Super-Mafos (Dishwashing Cleanser)
Anhydrous Ammonia

SANITATION H T H

Positive sanitation is of prime and constant importance to schools and universities everywhere—particularly in connection with swimming pools, gymnasiums and locker rooms. For such a wide variety of sanitary requirements, Sanitation H T H is a convenient and reliable source of chlorine. A dry, free-flowing, readily soluble product, Sanitation H T H contains 70% available chlorine and will retain that strength through long periods of storage. The convenient, easy-to-handle 5-lb. cans of Sanitation H T H are packed nine to the case.

For Swimming Pools

For the continuous or periodic chlorination of swimming pool water, Sanitation H T H offers the advantages of dependability, simplicity and low first-cost of chlorinating equipment.

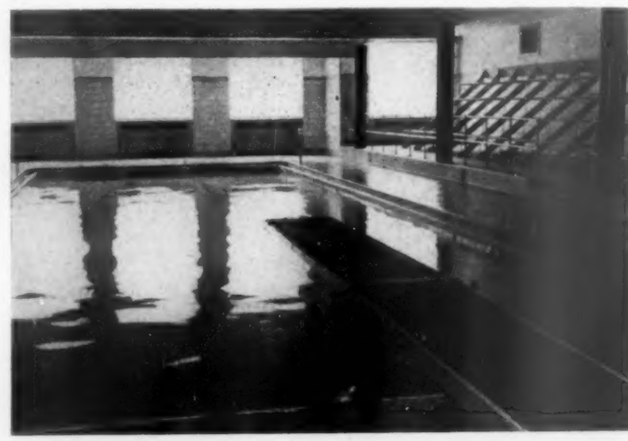
Hypo-chlorinating equipment is available for continuous disinfection of pools of every size with H T H solutions, offering accurate dosage and substantial economy in operation. For supplementary use during emergencies and peak loads, Sanitation H T H has been accepted and is stocked by hundreds of swimming pools throughout the country.

In addition to keeping the pool water safe, Sanitation H T H is recommended for use in a coordinated, entrance-to-exit sanitation routine to keep locker rooms, toilets, runways and other pool surroundings safe and sanitary. A valuable 48-page manual, "Keeping the Pool Safe and Sanitary," is available upon request, without cost or obligation.

To Aid in Athlete's Foot Prevention

Sanitation H T H provides effective fungicidal footbath solutions to help prevent the transmission of athlete's foot. Locker rooms, shower rooms, toilets, pool runways, etc. are, without question, among the worst offenders in the spread of athlete's foot.

Experience indicates that the best preventative is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H



The Peekskill (N. Y.) indoor swimming pool, where Sanitation H T H is used for supplementary hypo-chlorination of the pool water and for general sanitation of the pool surroundings.

and Lo-Bax, both in footbaths and for general disinfection of all surfaces which may transmit infection.

Sterilizing and Bleaching

School laundries, like commercial laundries, find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. H T H Bleach helps to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15, containing 15% available chlorine, is highly useful as a china dip for the removal of stains from dishes and chinaware.

Lo-Bax—A convenient chlorine carrier packed in handy bottles and containing 50% available chlorine. For preparing footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—PH-Plus restores the alkalinity which pool water loses during disinfection—eliminates the acidity that makes eyes smart—makes purification more effective and residual chlorine less noticeable. Made in convenient, fused ½-lb. cakes, packed in 100-lb. bags.

Super-Mafos—A unique dishwashing detergent in hard briquet form. Super-Mafos offers effective control of alkalinity or wash strength of washwater—assures clean, sanitary dishes.

* Formerly The Mathieson Alkali Works (Inc.)

ELECTRIC-AIRE ENGINEERING CORP.

209 W. Jackson Boulevard, Chicago 6, Illinois

Manufacturers and Distributors of Quality Hand and Hair Evapo-Dryers

ELECTRIC-AIRE EVAPO-DRYERS for Personal Hand Drying

TYPES AND INSTALLATION

Two types for wall mounting: semi-recessed and wall surface mounting. Each unit completely self-contained and mechanisms interchangeable. Push button, automatic control eliminates additional installation of foot control—dryer operates 37 seconds before automatically shutting off. Units are compact—dimensions 6¾" x 15"—equipped with tested and approved quick-acting heating element of lasting strength and durability, with highly perfected insulation to provide complete protection from any possible shock. Automatic louvers and nozzle guard completely protects against insertion of fingers or foreign substances of any kind—even water. Current consumption only one KWH per 100 drys. Heavy coated high temperature baked enamel finish in gleaming white with black trim is exceptionally durable and will not chip in ordinary use. Units backed by twenty-four years of hand dryer engineering experience and subjected to years of grueling tests under exceptionally trying conditions—the most dependable hand dryer available. Installation specifications and roughing-in drawings promptly supplied upon request.

BUILDING MAINTENANCE ADVANTAGES

Electric-Aire Evapo-dryers are the permanent solution to wash room maintenance problems and this improved, perfected hand dryer eliminates constant buying, storing, distributing, collecting and disposing of towels.

Does away with marred walls and unsightly towel containers.
Provides clean, attractive wash rooms with no soiled towel litter.
Greatly reduces janitor or maid service—**continuous, automatic** drying service without attention.
No fire hazard from accumulated soiled paper towels; no clogged toilet bowls.

Quick, thorough, pleasing hand drying service—no high laundry costs or constant paper towel replacement and disposal—always available, **completely automatic.** Saves 85% to 95% over other types of drying service; quickly amortizes its original cost.

USER ADVANTAGES

Absolutely personal hand drying in 30 seconds without contamination or scratchy unpleasantness of paper toweling. Provides deep-pore penetration of pleasing warm air to completely evaporate all moisture from the pores and stimulate quick replacement of natural oils—**thereby preventing skin roughness and chafing.**

Highly sanitary. No soiled "end of towel" hanging from empty cabinet to spread disease from one user to another. Clean, neat, attractive wash rooms always.

ELECTRIC-AIRE

is a **different** and improved drying service that is fast, pleasant and efficient. Completely envelops the hands in a soft flow of warm air instead of an unpleasant, inefficient searing blast; and provides complete user satisfaction.

Write for complete information on prices, installation and Electric-Aire unparalleled guarantee.

ELECTRIC-AIRE HAIR DRYERS

for permanent installation in swimming pools, shower dressing rooms, and the home, — dry gently and thoroughly without tangling or knotting.

Four types of switch operation—

1. **Remote control—single speed with uniform temperature and air velocity.**
2. **Individual Rheostat Control provides variable air velocity and temperature as desired.**
3. **Automatic cut-off time switch confines operating time to actual needs.**
4. **Coin Operated. Five minutes for five cents. Fully automatic. (Wall-surface mounting only.)**

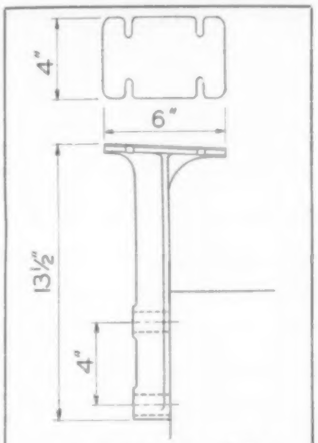
Write for particulars

HOHMANN & BARNARD, INC.

204-206 East 33rd Street, New York 16, N. Y.

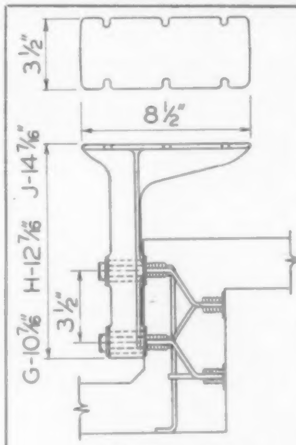
Phone MUrray Hill 3-3796-7-8-9

STADIUM & GRANDSTAND SEATING



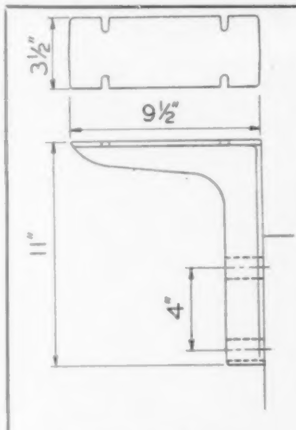
PATTERN #701

12 YEARS EXPERIENCE

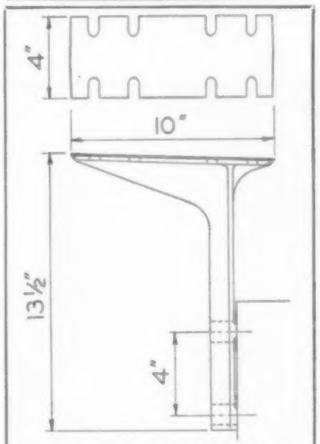


SERIES 708

OVER 300 STADIUMS



PATTERN #711

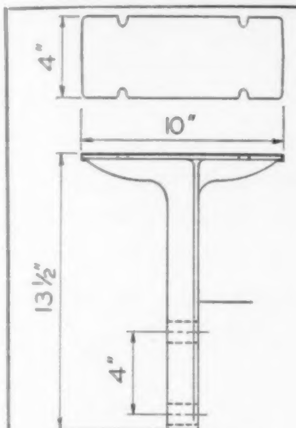


PATTERN #703E

SPECIFICATIONS

Malleable Iron Seat Brackets shall meet ASTM Specification A 47-33 Grade 32510 and shall be Pattern No. .... as manufactured by HOHMANN & BARNARD, INC., New York City 16, N. Y.

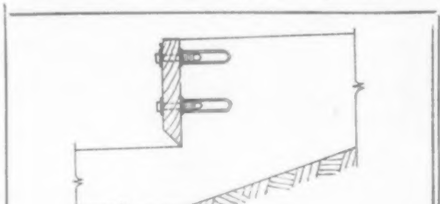
They shall be fastened to the risers with ½" Dia. Galvanized Tylags and Galvanized Cut Washers and either Tyframes or Tyloops as manufactured by RICHMOND SCREW ANCHOR CO., INC., Brooklyn, N. Y.

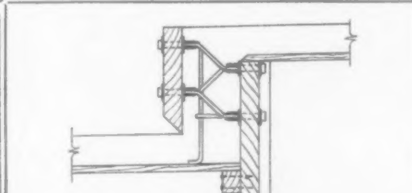


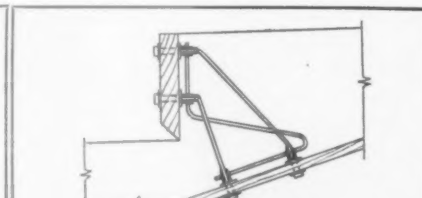
PATTERN #715

NOTE: Top plates have a minimum width of 3½" for ample edge distance when ends of two planks abut on one bracket. Slotted holes for anchorage to riser are ⅝" x 1" to allow the workman ample adjustment when placing the bracket and leveling the plank.

As we are constantly making improvements contact us for latest developments.


TYLOOPS FOR RISER ON FILL


TYFRAME FOR TYPICAL RISER FORM


TYFRAME FOR RISER ON SLOPING SLAB

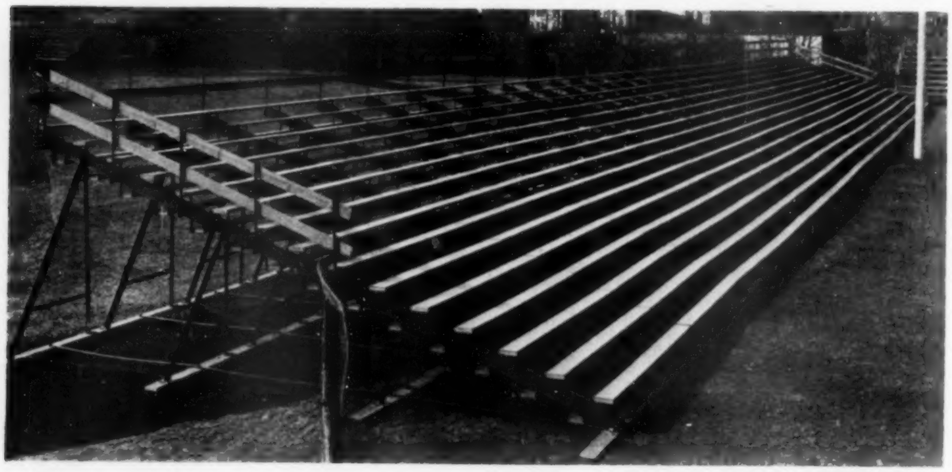
IF TYPE OR SIZE WANTED IS NOT SHOWN—SEND IN YOUR SKETCH. OUR FACILITIES ARE YOURS TO COMMAND IN PROVIDING THE EXACT TYPE OR SERIES YOUR WORK MAY REQUIRE.

HUSSEY MFG. CO., INC.

Ironworkers Since 1835

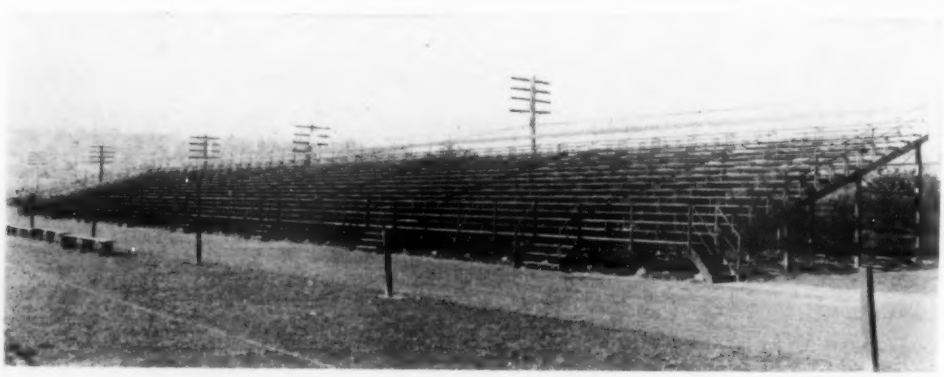
North Berwick, Maine

"STEEL-FRAME" PORTABLE BLEACHERS AND GRANDSTANDS



The only portable bleacher made with an all - steel frame that is really portable, having folding horses and alloy high tensile rust-resisting steel stringers. All fixed connections electrically welded. Made in 4 to 15 tiers, cny length. Design patented.

Portable and semi-permanent grandstands designed and furnished to fit your requirement. All lumber preserved by pressure treatment if desired.



Permanent grandstands of various types furnished, delivered and erected complete.

We maintain a complete engineering staff, available for special or standard designs for any size installation. Representatives in various parts of the country. Write our home office for literature and full information.

BLEACHERS AND GRANDSTANDS BY HUSSEY

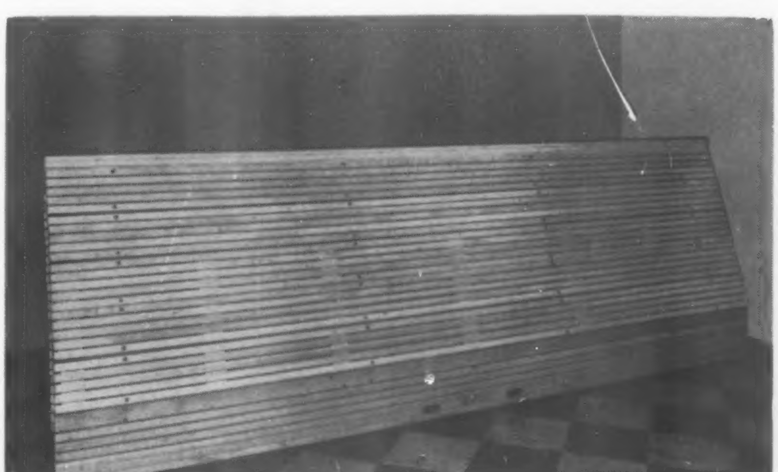
HORN BROTHERS CO.

Fort Dodge, Iowa

SALES AND SERVICE FROM COAST TO COAST

THREE GYMS IN ONE!

Presenting the latest improvement in the outstanding Horn Folding Bleachers. Available at no extra cost is the new non-slip slotted Bleacher Seat designed to give long service. Check these features: Chair Height Seats, Load Directly to Floor, Safety Inclined Front, No Limit to Size, Automatic Locking, Self Enclosed Top, Ample Leg Room, Easily Cleaned. A compact, efficient unit engineered for your particular requirements.

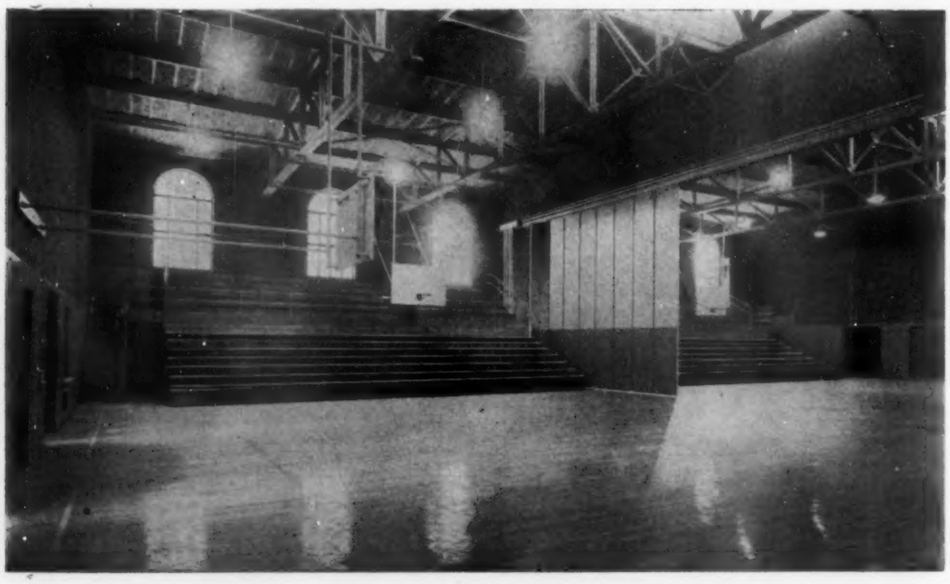


Using the perfect combination—Horn Folding Bleachers and Horn Folding Partitions—your gym requirements can be met. Horn Folding Bleachers with Steel Understructure, Steel Cross Bracing, Metal Alloy Wheels and Beautifully finished for lasting service will complete the modern gym.

For more than a quarter of a century Horn Folding Partitions have been the outstanding choice. Every worthwhile improvement has been engineered, developed and pioneered by this company. Today the finest public buildings are equipped with genuine HORN partitions and bleachers. All products manufactured by this company are built with same standard of quality set up by its founder Paul Horn.

HORN FOLDING GYM SEATS AND FOLDING PARTITIONS

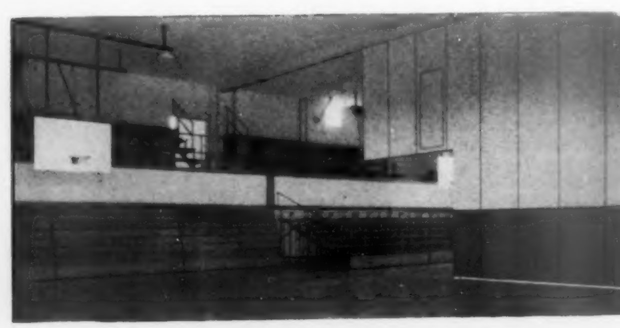
Today's requirement for modern gyms requires, in each school, three gymnasiums. One for the weekly basketball game, requiring a full size court and seating space. Another gym is required for boys, and one for girls. The installation of HORN Automatic Electric Folding Partitions and HORN Folding Gym Seats is the practical and economical solution to the problem. It is possible, in this way, to provide ample spectator seating space for the weekly inter-school basketball games, secure in the knowledge that this space is not idle during the school week. Spectators attending weekly contests provide valued contributions to the school spirit and treasury.



Above **— Electric Folding Doors in partially opened position with folding gym seats in position ready for use**

Above—Electric Partition completely folded. Gym Seats open for use

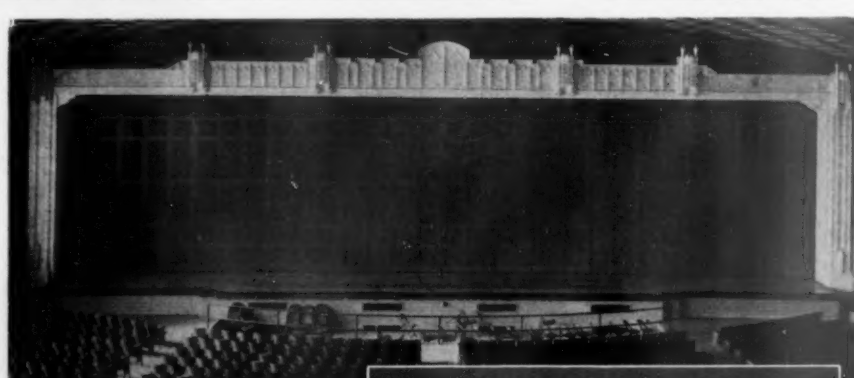
At Right**—Gym Seats folded. Partition partly open**



Above—Illustration shows Folding Partition cut out for Balcony

"GYMATORIUM" DOORS

The "Gymatorium" has been very popular in years past since it provides a large gymnasium for classwork and basketball as well as an auditorium. The stage at the one end can be separated from the gymnasium by means of an electric folding partition. This partition is sufficiently sound-proof to allow the stage to be used simultaneously with the gymnasium. Often the stage is used as a band room. In this plan, the gymnasium proper is also divided to provide a gym for boys and girls. Folding gym seats are extremely important in this plan as the saving in space afforded by the folded gym seats makes available the necessary room for the cross courts.



Above—Electric Partition between Auditorium and Gym

At Right**—Stage Gym is also divided**

HORN BROTHERS COMPANY • FORT DODGE, IOWA

★ GENERAL DATA ★

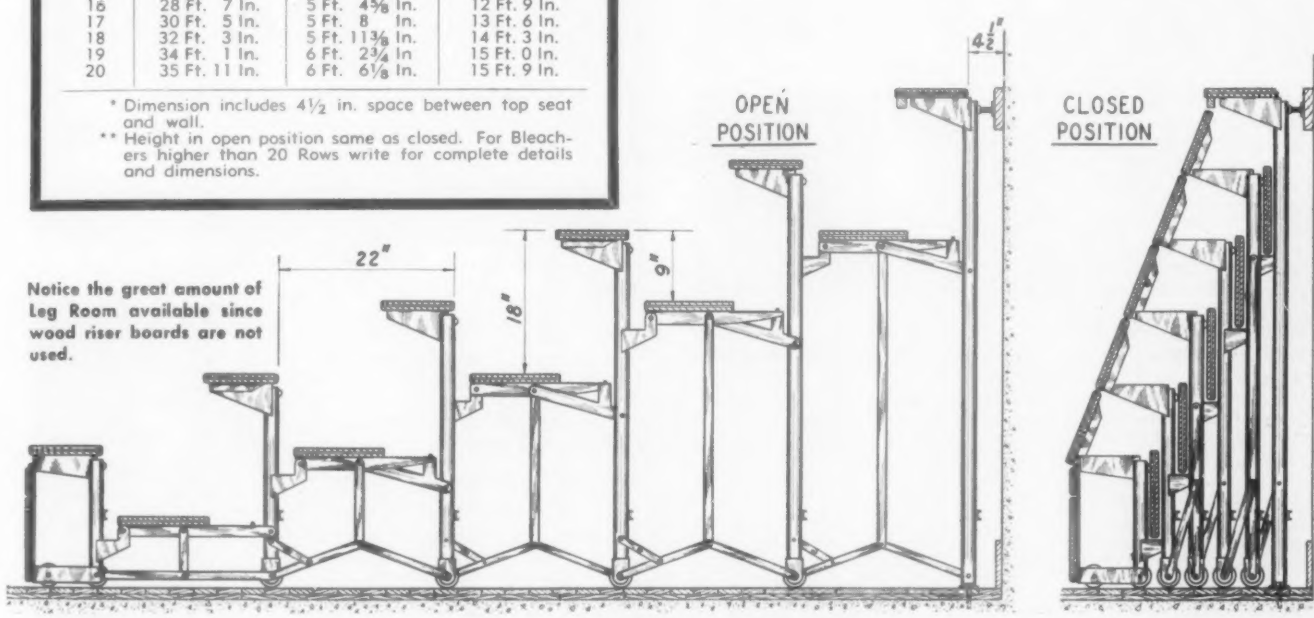
Rows	FLOOR SPACE		** Height
	In Use	* Closed	
3	4 Ft. 9 In.	1 Ft. 8¾ In.	3 Ft. 0 In.
4	6 Ft. 7 In.	2 Ft. 0⅛ In.	3 Ft. 9 In.
5	8 Ft. 5 In.	2 Ft. 3½ In.	4 Ft. 6 In.
6	10 Ft. 3 In.	2 Ft. 6⅞ In.	5 Ft. 3 In.
7	12 Ft. 1 In.	2 Ft. 10¼ In.	6 Ft. 0 In.
8	13 Ft. 11 In.	3 Ft. 1⅝ In.	6 Ft. 9 In.
9	15 Ft. 9 In.	3 Ft. 5 In.	7 Ft. 6 In.
10	17 Ft. 7 In.	3 Ft. 8⅜ In.	8 Ft. 3 In.
11	19 Ft. 5 In.	3 Ft. 11¾ In.	9 Ft. 0 In.
12	21 Ft. 3 In.	4 Ft. 3⅛ In.	9 Ft. 9 In.
13	23 Ft. 1 In.	4 Ft. 6½ In.	10 Ft. 6 In.
14	24 Ft. 11 In.	4 Ft. 9⅞ In.	11 Ft. 3 In.
15	26 Ft. 9 In.	5 Ft. 1¼ In.	12 Ft. 0 In.
16	28 Ft. 7 In.	5 Ft. 4⅝ In.	12 Ft. 9 In.
17	30 Ft. 5 In.	5 Ft. 8 In.	13 Ft. 6 In.
18	32 Ft. 3 In.	5 Ft. 11⅜ In.	14 Ft. 3 In.
19	34 Ft. 1 In.	6 Ft. 2¾ In	15 Ft. 0 In.
20	35 Ft. 11 In.	6 Ft. 6⅛ In.	15 Ft. 9 In.

* Dimension includes 4½ in. space between top seat and wall.

** Height in open position same as closed. For Bleachers higher than 20 Rows write for complete details and dimensions.

NOTE: It is suggested that the top seat be set out from the wall not less than 4½ inches as otherwise that seat will be decidedly uncomfortable. The space requirement schedule allows for this space. When making comparisons be sure to consider this space.

Notice the great amount of Leg Room available since wood riser boards are not used.



HORN STANDARD TYPE BLEACHER

(1) All folding bleachers shown on the plans will be HORN Folding Bleachers as manufactured by the HORN BROTHERS COMPANY, Fort Dodge, Iowa.

(2) Bleachers shall be installed by factory-trained mechanics and the entire installation guaranteed against faulty materials, workmanship, and operation.

(3) Quantities are as follows: Total length of sections shall be **(specify)** consisting of **(specify number)** rows. When closed the seats shall not extend from the wall in excess of **(specify)**. When open, seats shall not extend from the wall in excess of **(specify)**.

(4) Bleachers when in use shall be designed and constructed to safety support, in addition to their own weight, a live load of 120 lbs. per lineal foot on both seatboard and footboard and a horizontal swaying force applied to the seats of 24 lbs. per lineal foot of seats plus a factor of safety of 4.

(5) Bleachers shall operate on the telescoping principle, whereby all seats fold below the top seat accomplished by means of folding arms. No rollers or slides will be permitted. Units shall be fitted with heavy duty metal alloy rollers to prevent marring floors. They can be so arranged that any number or all of the seat rows may be extended for use as required. Provide automatic locking equipment which will positively lock the bleacher in open position without the use of bolts or floor sockets.

(6) When bleachers are in a closed position, the seatboards shall automatically rise to an upright position to completely enclose the unit. Provide cylinder locks, keyed alike.

(7) Seat and footboards shall be genuine vertical grain Douglas Fir, 1¼-inch stock, carefully sanded before finishing. Edges of all boards shall be splined to prevent splitting. Woodwork shall be finished with two coats of the best quality of bakelite sealer in a standard color. Steel understructure shall be given two coats of school furniture brown or chrome aluminum.

ENGINEERING DATA

Since it is impossible to catalog all the special information on equipment of this kind, it is suggested that you permit our Engineering Department to prepare the layouts, specifications, and cost estimates. This is a service regularly rendered and will not obligate you in any way.

Write to Home Office addressing Engineering Department.

MOBILE BLEACHERS

Many gymnasium arrangements are made more usable by the HORN Mobile bleacher unit. At slight additional cost a standard HORN bleacher can be furnished with a special caster arrangement to allow easy mobility.

Details on request.

GREATER COMFORT and SAFETY

The following features have contributed to the ever increasing popularity of HORN FOLDING BLEACHERS

CHAIR HEIGHT SEATS

In choosing a bleacher be sure to consider only those giving full 18-inch chair height seats. A good basketball game can be made more enjoyable by comfortable seats.

LOAD DIRECTLY TO FLOOR

It is significant to note that each seat and footboard is supported directly to the floor and since a plus factor of safety has been built into the bleacher there is never a possibility of a failure.

SAFETY INCLINED FRONT

There is less possibility for casualties in the gymnasium equipped with HORN bleachers since the inclined front decreases the possibility of danger to a basketball player running up to the closed units. There are no edges which protrude in any way and since the top of the bleacher slopes back the vital part of the body is not subject to injury in falls.

NO LIMIT TO SIZE

Because of the exclusive telescoping principle of operation through the use of folding arms, there is no limit to the number of rows which may be used. The Space Requirement Schedule on Page 8 lists bleachers up to 20 rows in height. For bleachers higher than this consult our Engineering Department.

AUTOMATIC LOCKING

The HORN bleacher features synchronized locking which automatically locks each row in the open position as the bleacher operates. This is an automatic feature and assures utmost safety. No floor bolts or rubber pads are used to accomplish this locking.

SELF-ENCLOSED TOP

By referring to Page 8 you will note that the bleacher in the closed position has a self-enclosed top which does not permit a basketball to become lodged. This is automatically enclosed as the bleacher operates.

AMPLE LEG ROOM

Since riser boards are not required on the HORN bleacher, there is considerably more leg room than will be found in any other type of gymnasium seating. The spectator may shift his position since the legs can easily be rested underneath the seat, the same as with an auditorium chair. There is a distance of 18 inches from the footboard to the seatboard, thus assuring maximum comfort.

GUARANTEE

Each HORN installation is fully guaranteed against faulty workmanship and operation. A guarantee is only as good as the skill and integrity of the manufacturer. For a real guarantee use HORN folding bleachers.

EASILY CLEANED

Since both footboards and seatboards tilt to a vertical position when the bleacher is stacked, all of the dirt accumulated on the bleachers during a basketball game falls to the floor. When the bleacher is closed this accumulation of dirt is easily swept away with a minimum of effort. The seatboards are also easily dusted when the bleacher is in the stacked position.

COMPLETE MOBILITY OPTIONAL

By special arrangement the full section of the HORN bleacher may be made mobile so that it can be used in other parts of the gymnasium. This feature is obtainable at only a slight additional cost.

ANY NUMBER OF ROWS USABLE

It is possible to pull out one or more rows to form a bench-like arrangement in the gymnasium for social functions.

EXCLUSIVE PATENTED FOLDING ARMS

The patented folding arm principle of operation permits the use of steel cross bracing. Each full bleacher section has four supports directly to the floor. All understructure is electrically welded.

EASE OF OPERATION

One man can easily operate the HORN folding bleacher regardless of the number of rows. There is no chance of sticking or binding because of the folding arm principle of operation.

METAL ALLOY WHEELS

The HORN bleacher is transported from the open to the closed position and vice versa on wide-faced metal alloy wheels which do not mar the floor in any way.

MINIMUM SPACE REQUIREMENT

Because of the folding action through the use of the exclusive folding arm principle of operation, the HORN bleacher requires less space when in the closed position. (See Space Requirement Schedule on Page 8.)

BEAUTIFULLY FINISHED BOARDS

The seat and footboards of the HORN bleacher are genuine vertical grain Douglas Fir. The edges are neatly rounded and the ends of the boards are splined to prevent splitting. All seat and footboards are 1 ¼-in. stock, carefully sanded before finishing. The beautiful bakelite finish which is applied at the factory, compares favorably with the finest school furniture.

STEEL UNDERSTRUCTRE

The understructure is entirely of steel, electrically welded into a solid unit. No wood parts are depended upon for strength. Consequently, the understructure is not affected in any way by atmospheric changes.

STEEL CROSS BRACING

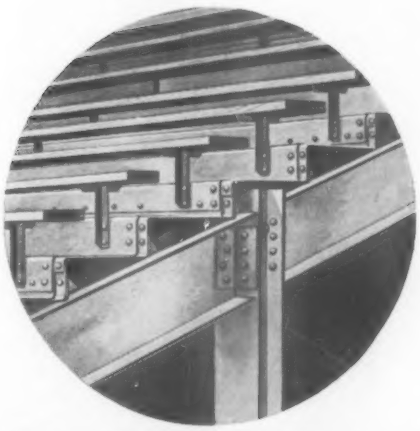
The entire understructure is braced by steel which is electrically welded into a solid unit. The bleacher cannot become out of adjustment in any way.

The Outstanding Choice From Coast to Coast

PITTSBURGH - DES MOINES STEEL COMPANY

3425 Neville Island, Pittsburgh, Pa.
Room 994—270 Broadway, New York
1215 First National Bank Bldg., Chicago
924 Tuttle Street, Des Moines, Iowa
1224 Praetorian Bldg., Dallas, Texas
614 Rialto Bldg., San Francisco, Calif.

Steel Deck Grandstands



Pittsburgh-Des Moines Steel Deck Grandstands serve schools and colleges from coast to coast with maximum values of safety, comfort, permanence and fine appearance for mass outdoor seating. Employing a unique system of unitized construction, these Grandstands permit complete design flexibility and rapid, economical erection. Built in standard sections, the original installation can be small or large, according to requirements; sections can be added at any time to increase capacity in depth, width or both. Units may be built along one, two or three sides of the field, or may completely enclose it. When assembled by bolts, stands may be dismantled and re-erected at a new location if desired; welded construction may be employed for permanent installation.

Pittsburgh-Des Moines Grandstands have weathertight steel decks supported by heavy steel underbracings. The underdeck space may be utilized for dressing rooms, toilet facilities, storage, etc.; when desired, masonry walls may be built along the ends and back of the stands to provide a total enclosure of the space under the stands. These Grandstands are finished complete with guardrails, steps or ramps, and built-in press box, if specified. Cast iron or welded steel stools, securely bolted to the deck, support the wood seat planks; other types of seats are furnished if desired.

SEATING CAPACITY

Pittsburgh-Des Moines Steel Deck Grandstands are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep, with special sections provided for corners and to utilize all space available. Aisles, 3′ 0″ wide, extending from front to rear of the stand are spaced 36′ 0″ apart, measured from center to center of aisles. Thus, the net seating length of a bay is 18′ 0″ less half the width of an aisle or 16′ 6″. Allowing 16½″ for each seat, there are 12 seats per row per bay or 120 seats per bay. On the basis of the above, the seating capacity of a standard stand may be calculated as follows: Length of stand in feet x 12/18 x number of rows = number of seats, or number of standard sections x 120 = number of seats.

(*Circle*) Deck Construction Detail

(*Above, Left*) General Deck View

(*Left*) Underdeck Supports, Showing Sturdy Steel Construction

The permanence of Pittsburgh-Des Moines Grandstands makes them a lifetime investment. They do not weather, rot or decay and, therefore, will not weaken or collapse. Their first cost is low, and they have a high salvage value. The only maintenance necessary is an occasional coat of paint, which keeps them looking new year after year. You are cordially invited to write to our nearest office for current literature; a Pittsburgh-Des Moines representative will be glad to consult with you on your future plans, and to provide any desired assistance without obligation.

Jefferson Davis Parish School, Monroe, Louisiana—Seating Capacity, 1850

Paulsboro, New Jersey, High School. Seating Capacity, 960

Waterbury, Connecticut, High School. Masonry Enclosed Sides and Rear. Seating Capacity, 4400

LEAVITT CORPORATION

206–220 Griggs Street, Urbana, Illinois

KNOCKDOWN BLEACHERS

REG. U. S. PAT. OFF.

KNOCKDOWN bleachers as used outdoors

or moved indoors

ADD-A-SEAT stadium
(under construction)

As originators of portable bleacher seating we respectfully solicit inquiries concerning your bleacher needs of all types wood, or steel.

The picture, at the left, presents a view of our ADD-A-SEAT stadium under construction as a War Memorial. Note the rigidity and permanency of structure.

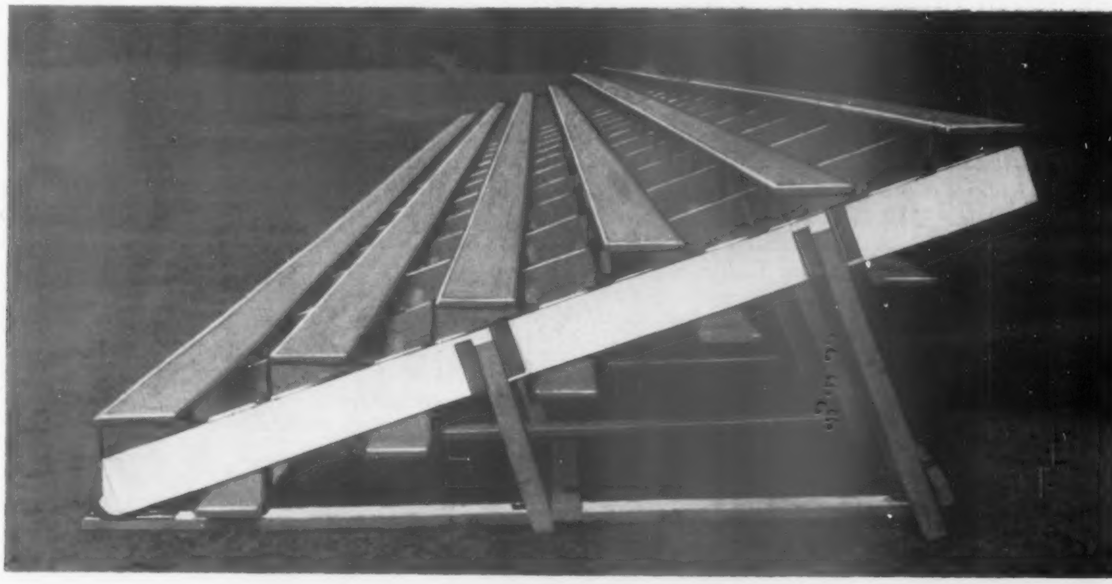
Our gymnasium Telescoping bleachers solve the need for added floor space.

KNOCKDOWN was the first portable bleacher and remains famous for the many safety and comfort features exclusive to its design.

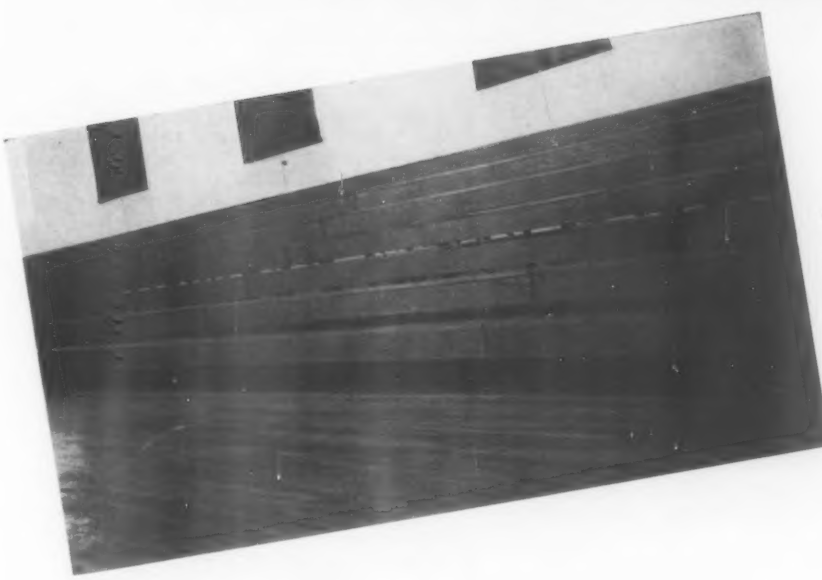
KNOCKDOWN BLEACHERS

REG. U. S. PAT. OFF.

"THEY RISE TO THE OCCASION"

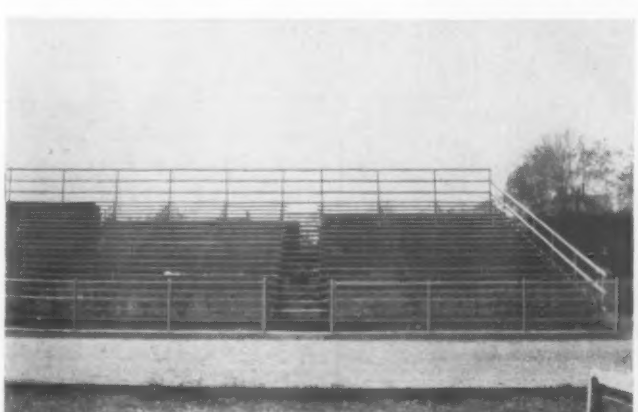


6 Tier provides seats for any occasion



Telescopic type provides greater utility of floor space

ADD-A-SEAT stadium (steel)



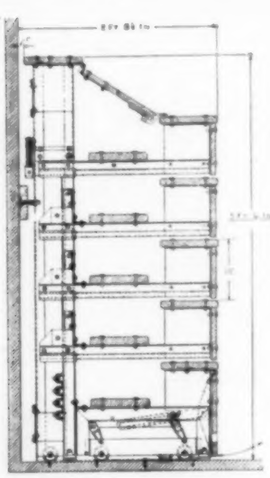
FRED MEDART PRODUCTS, INC.

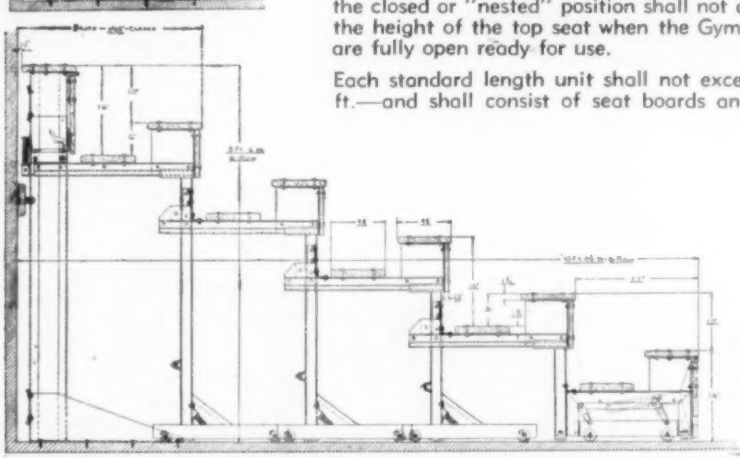
Potomac and DeKalb Streets
Saint Louis, Mo.
ENGINEERING AND SALES SERVICE IN ALL PRINCIPAL CITIES

MEDART TELESCOPIC GYM SEATS

Outstanding among the many features of this modern seating is the ease with which seats glide in and out of the "nested" position, in one operation. Use of the telescopic principle eliminates the need for any counterbalance mechanism (springs) and consequently there is nothing to lift up or to pull down; no closure panel and no possibility of any parts of the seat falling on the operator. Understructure is of steel. Foot and seatboards, intermediate risers, and top and bottom kickboards are of wood. When Medart Gym Seats are installed in a gymnasium it is possible to quickly and easily provide a bench with a comfortable back rest for dances or special classes of instruction by simply withdrawing the one (lower) row of seats from the "nested" position, thus eliminating the need for folding chairs or other auxiliary seating. Medart Gym Seats are fully approved and recommended by the structural engineering department of one of our leading universities as a result of an exhaustive analysis and of actual tests made by these authorities.

THE WALL ATTACHED TYPE





Specifications

As shown on plans and as covered by these specifications, contractor will deliver (and install) the following standard (and special) length units of Medart Telescopic Gym Seats, as furnished by FRED MEDART PRODUCTS, INC., ST. LOUIS, MO., or the approved equal in the opinion of the architect.

. . . standard 16 ft. long units, . . . rows high
. . . special . . . . . . long units, . . . rows high

Gym Seats shall operate on the telescopic principle, which requires only one operation for opening (or closing) and shall permit one or more rows of seats to be opened for use, while the remaining rows are left in the closed or "nested" position. When closed, Gym Seats shall not extend from the wall in excess of 2 ft. 8 in.; when in open position, Gym Seats shall not extend from wall in excess of . . . . (see table below). The height of the Gym Seat in the closed or "nested" position shall not exceed the height of the top seat when the Gym Seats are fully open ready for use.

Each standard length unit shall not exceed 16 ft.—and shall consist of seat boards and foot boards of quality lumber which shall be carefully sanded, finished with rounded corners and bolted securely to steel members. All wood to be stained, shellacked and varnished.

The understructure shall be entirely of steel with uprights or posts of formed steel, double channel construction for maximum strength. Each standard length of seat to be supported by four such uprights or posts which are transported in and out of the closed or "nested" position by means of a multiple of rubber rollers with bronze bushings. When live load is applied, the added weight shall automatically overcome the tension of the compression springs attached to each upright, thus bringing the uprights or posts in direct contact with the floor.

All steel parts shall be finished with baked-on enamel.

To provide proper circulation of air, steel grilles shall be inserted in the riser (kick board) of the first (bottom) and top row of seats wherever a unit of Gym Seats is placed in front of a heating or ventilating unit. (. . . . units shall be furnished with grilles.)

Number of rows	Floor space		Height open or closed
	Extended	Closed	
3	4 ft. 6 in.	2 ft. 8 in.	3 ft. 0 in.
4	6 ft. 4 in.	2 ft. 8 in.	3 ft. 10 in.
5	8 ft. 2 in.	2 ft. 8 in.	4 ft. 8 in.
6	10 ft. 0 in.	2 ft. 8 in.	5 ft. 6 in.
7	11 ft. 10 in.	2 ft. 8 in.	6 ft. 4 in.
8	13 ft. 8 in.	2 ft. 8 in.	7 ft. 2 in.
9	15 ft. 6 in.	2 ft. 8 in.	8 ft. 0 in.
10	17 ft. 4 in.	2 ft. 8 in.	8 ft. 10 in.
11	19 ft. 2 in.	2 ft. 8 in.	9 ft. 8 in.

THE MOVABLE TYPE

For the occasional need or special condition when auxiliary seating, that can be quickly and easily moved from one location to another, is required. . . . Seats operate on the approved telescopic principle. . . . Ideal for use on the stage; in combination lecture and classrooms; to encompass the boxing or wrestling ring — and wherever else spectators must be accommodated with safe, practical, satisfactory seating. Easily moved to and from the storage room.

MEDART ENGINEERING SERVICE

A competent staff of Medart engineers is available to help you plan and lay out the most efficient and economical installation of equipment to meet your own special requirements. No obligation.

MEDART CATALOGS WILL BE FURNISHED UPON REQUEST

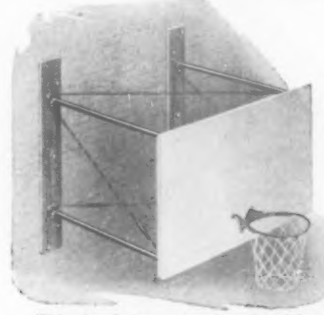
MEDART BASKETBALL BACKSTOPS

BALCONY TYPE BACKSTOPS

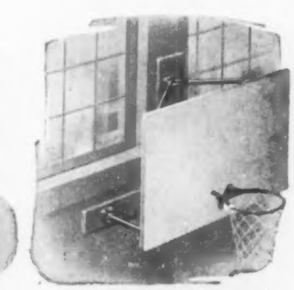
An economical method of installation but having obvious disadvantages. It is advisable to limit this type to practice courts. May be permanent (No. 478) or detachable (No. 479).

Backboard attached flush to face of balcony below floor level. Undesirable from spectators' viewpoint and because of restricted shots from corners of floor (No. 480).

WALL BRACED BACKSTOPS

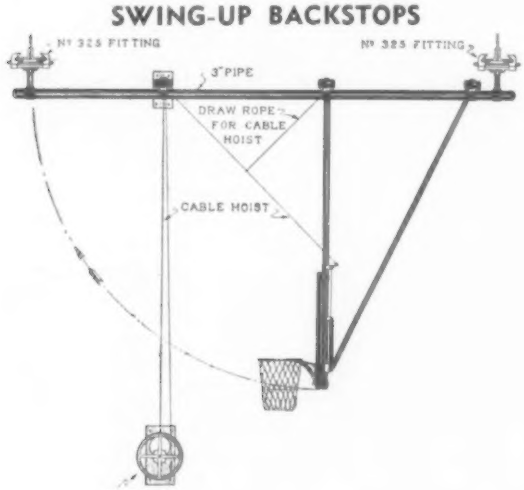


This backstop can be furnished with various length extension braces—2 ft. (No. 55), 3 ft. (No. 458), 4 ft. (No. 459), 5 ft. (No. 461). 6-, 7-, or 8-ft. braces can also be supplied.



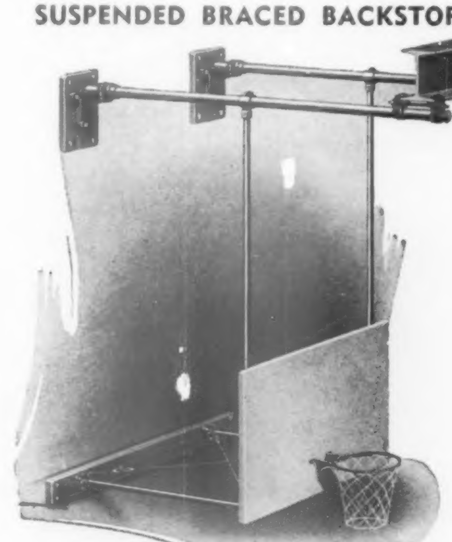
Structural condition and building equipment often necessitate special support. Illustration shows a bank with 2-ft. braces. (No. 439). Can be modified to suit.

SWING-UP BACKSTOPS



A steel cable attached to a friction geared winch raises the backstop forward, up to the ceiling. Diagonal braces are double knuckle jointed and elongate as backstop is being raised forward. When in lowered position, braces are automatically locked (No. 261).

SUSPENDED BRACED BACKSTOPS



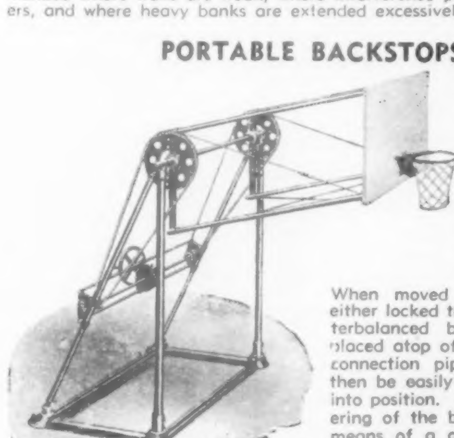
A common method of suspending a bank from 3-in. overhead pipe supports spanning the distance between a wall and girder. Recommended where walls are weak, where interference prohibits wall stringers, and where heavy banks are extended excessively (No. 420).

BACKBOARDS

Backstops can be supplied with plywood or glass rectangular-shaped backboards, or fan-shaped steel backboards. The latter are official by ruling of the National Basketball Committee of the United States and Canada. The **Medart Steel Fan-Shaped Basketball Backboard** has many superior and exclusive features, including:

One-piece steel construction; Smooth, unbroken surface; Deep 1½-inch side flange; Smooth, rounded edges; Steel braces 3 inches wide, "H" type, channel shaped—two horizontal and one vertical, securely welded to the backboard and to each other, providing absolute rigidity and an equal degree of bracing to the entire surface.
Four sets of 2 floating attachment lugs—provided (only by Medart) so that new backboards may easily be attached to old braces.
This backboard is fabricated to the same degree of perfection as the old Medart backboard. Size: 54 x 35 inches.

PORTABLE BACKSTOPS



Where girder heights in field houses are excessive, this floor-type backstop is ideal. It can be moved from place to place without dismantling.

When moved into position and either locked to the floor or counterbalanced by concrete blocks placed atop of the two rear base connection pipes, the bank can then be easily and quickly raised into position. The raising or lowering of the bank is effected by means of a geared winch which simultaneously operates two endless chain belts.
The face of the bank is brought out 7 ft. from the foremost pipe uprights and over 10 ft. from the cross pipes supporting the winch, thus giving maximum clearance under the basket. This backstop is practical, rigid, ruggedly built and easily handled (No. 455).

FRED MEDART PRODUCTS, INC.

Potomac and DeKalb Streets
Saint Louis, Mo.
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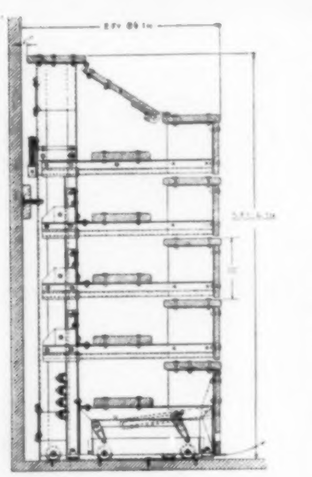

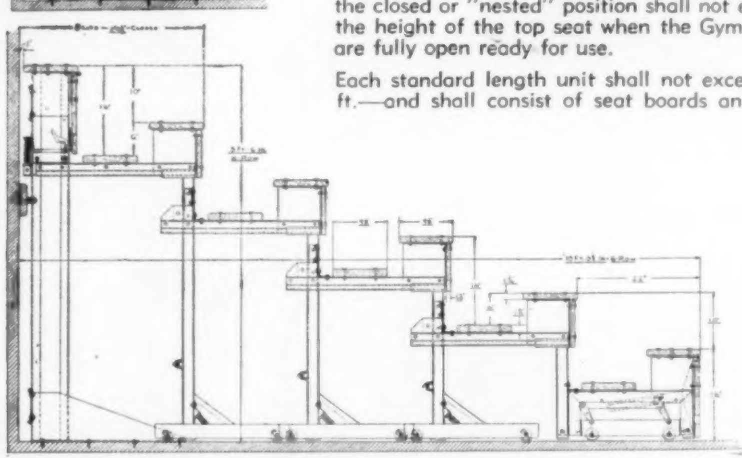

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6	10 ft. 0 in.	2 ft. 8 in.	5 ft. 6 in.
7	11 ft. 10 in.	2 ft. 8 in.	6 ft. 4 in.
8	13 ft. 8 in.	2 ft. 8 in.	7 ft. 2 in.
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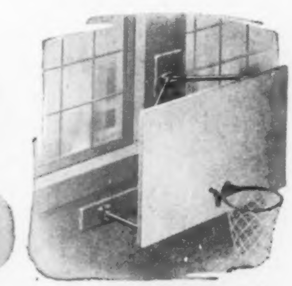

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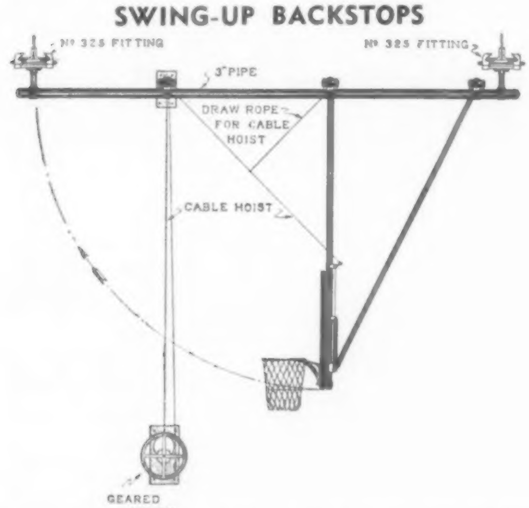

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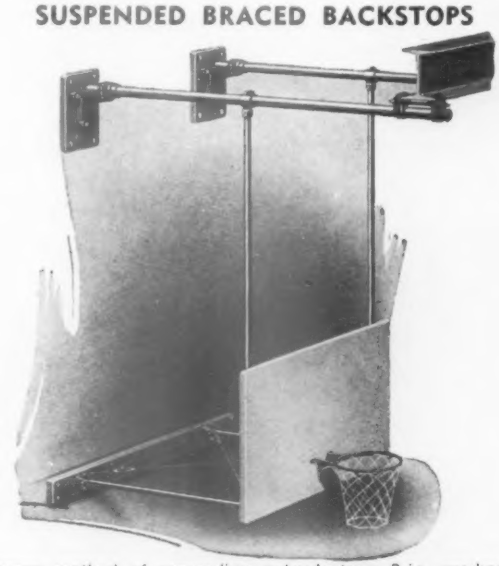

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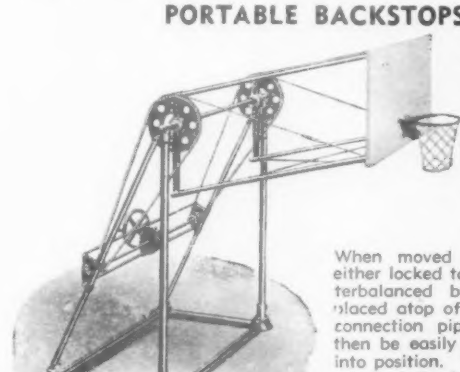

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UNIVERSAL BLEACHER COMPANY

606 South Neil Street, Champaign, Illinois

World's Largest Manufacturers of "Roll-A-Way" and "Fold-A-Way" Gymnasium Stands and Portable Wood and Steel Bleachers

THE PRODUCT OF EXPERTS . . . The results of over a third of a century of experience in the exclusive manufacture of stands and bleachers are yours when you install a UNIVERSAL. With safety uppermost in mind, UNIVERSAL stands are made to exceed the most rigid standards, hence their acceptance by leading schools, colleges and universities throughout the nation. Seat boards are joined with metal connectors to eliminate pinching or tearing of clothes and ends have metal fittings that prevent unauthorized removal of the seat boards.

UNIVERSAL Fold-A-Way GYMNASIUM STANDS . . . built to fit individual seating needs. Compact and attractive. Allow greater saving of valuable floor space when not in use. Sections are supplied in lengths up to 16 feet.

As the illustration above indicates, Fold-A-Way Gymnasium Stands give added space when they are folded away. Their superior construction assures trouble-free operation for many years, while the added seating made available through their use pays big dividends.

UNIVERSAL Fold-A-Way TABLE OF SIZES

Rows High	Depth Opened	Depth Closed	Space Gained	Height In Use	Height Closed
3	4' 8"	1' 8"	2' 0"	3' 0"	3' 0"
4	6' 6"	1' 11½"	4' 5½"	3' 11½"	3' 11½"
5	8' 4"	2' 3"	6' 1"	4' 11"	4' 11"
6	10' 2"	2' 6½"	7' 7½"	5' 10½"	5' 10½"
7	12' 0"	2' 10"	9' 2"	6' 10"	6' 10"
8	13' 10"	3' 1"	10' 9"	7' 9½"	7' 9½"
9	15' 8"	3' 5"	12' 3"	8' 9"	8' 9"
10	17' 6"	3' 8"	13' 10"	9' 8½"	9' 8½"

UNIVERSAL PORTABLE STEEL BLEACHERS . . . Vertical legs give rigid support and strength. For indoor and outdoor use. Easily and quickly erected without special tools. Sections come in 18-foot lengths.

These easy to erect steel stands have a safety factor far above requirements anywhere. Their construction assures years of use in the entire range of sports from football outdoors to basketball indoors. This multiple-use feature makes them the most economical all-purpose steel stands available. Consult table at bottom of page for specifications.

UNIVERSAL Roll-A-Way GYMNASIUM STANDS . . . Capacity crowds can be comfortably and safely seated. Stands roll conveniently and compactly back against the wall after use, providing considerably more floor space. Sections come in lengths up to 16 feet.

Roll-A-Way Stands have all the space-saving features of the Fold-A-Way models described above. The Fold-A-Way table may be used for figuring Roll-A-Way stands, as the area used is the same. However, the Roll-A-Way can be furnished in sizes up to 20 rows. Roll-A-Way Stands are easy to open and close because they operate on the easy-acting folding-arm principle.

UNIVERSAL PORTABLE WOOD BLEACHERS . . . Made of heavy, select materials and designed for speed and ease of erection. See table below.

CAPACITY TABLE FOR PORTABLE WOOD BLEACHERS

ROWS HIGH	5	6	7	8	9	10	15	20
Length of Group	Total Seating Capacity							
15 ft.	55	66	77	88	99	110	165	220
45 ft.	165	198	231	264	297	330	495	660
60 ft.	220	264	308	352	396	440	660	880
90 ft.	330	396	462	528	594	660	990	1320
120 ft.	440	528	616	704	792	880	1320	1760
150 ft.	550	660	770	880	990	1100	1650	2200
180 ft.	660	792	924	1056	1188	1320	1980	2640
240 ft.	880	1056	1232	1408	1584	1760	2640	3520
300 ft.	1100	1320	1540	1760	1980	2200	3300	4400
Depth Front to Back	9' 2"	10' 9"	12' 8"	14' 11"	16' 9"	18' 9"	27' 6"	37' 3"
Height of Top Row	4' 1"	4' 9"	5' 5"	6' 1"	6' 10"	7' 6"	10' 1½"	13' 3"

CAPACITY TABLE FOR PORTABLE STEEL BLEACHERS

ROWS HIGH		5	6	7	8	9	10	11	12	13	14	15
No. of Sections	Length of Group	TOTAL SEATING CAPACITY										
1	18 ft.	65	78	91	104	117	130	143	156	169	182	195
3	54 ft.	195	234	273	312	351	390	429	468	507	546	585
5	90 ft.	325	390	455	520	585	650	715	780	845	910	975
7	126 ft.	455	546	637	728	819	910	1001	1092	1183	1274	1365
9	162 ft.	585	702	819	936	1053	1170	1287	1404	1521	1638	1755
11	198 ft.	715	858	1001	1144	1287	1430	1573	1716	1859	2002	2145
13	234 ft.	845	1014	1183	1352	1521	1690	1859	2028	2197	2366	2535
15	270 ft.	975	1170	1365	1565	1755	1950	2145	2340	2535	2730	2925
17	306 ft.	1105	1326	1547	1768	1989	2210	2431	2652	2873	3094	3315
Depth Front to Back		8' 10"	10' 10"	12' 10"	14' 10"	16' 10"	18' 10"	20' 10"	22' 10"	24' 10"	26' 10"	28' 10"
Height of Top Row		4' 0"	4' 8"	5' 4"	6' 0"	6' 8"	7' 4"	8' 0"	8' 8"	9' 4"	10' 0"	10' 8"

UNIVERSAL PORTABLE WOOD BLEACHERS illustrated above the table are a triple threat product. Move them indoors, outdoors or store them away. Built with a safety factor four times that required or needed. Comfort for your patrons and added facilities for your athletic events.

PLAN YOUR TOMORROW'S SEATING TODAY!

Our engineers will assist you in planning your own installation. Send us the measurements of present or proposed athletic field or dimensions of indoor area together with number of seats required. In your letter state also that you would like more detailed information and it will be promptly forwarded to you.

WAYNE IRON WORKS

Wayne Penna.

Manufacturers and Builders of Permanent Stadiums, Steel, Portable Grandstands, Steel-Deck Stands and Folding and Rolling Gymstands for schools, colleges, clubs and industrial concerns.

These two pages are designed to help you determine the type of Grandstand or Gymstand that best meets your requirements. Each of the many types of Wayne Stands are pictured and briefly described.

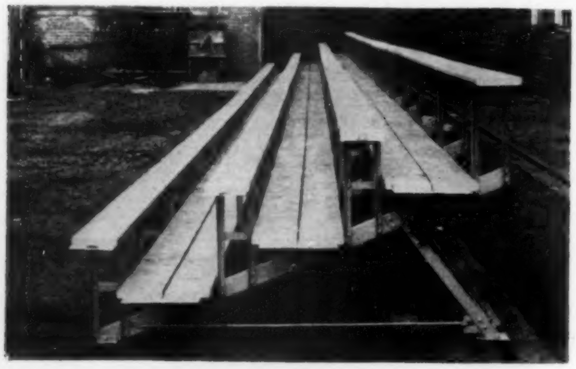
Check the features of each against your specifications until you determine the type you want, then—when this has been done—write us for detailed, technical information on the stand of your choice. Complete information will be sent to you at once.

TYPE "G" PORTABLE GRANDSTAND

This stand is designed for use on athletic fields or in field houses. It is readily portable—can be moved from place to place or left in place indefinitely. Erection is simple, requiring no nuts, bolts, screws or special tools. The stand can be built with any number of rows from 2 to 50, and can be used as a short, high stand or a long, low stand. Supports are steel—seatboards and footboards are made of wood.

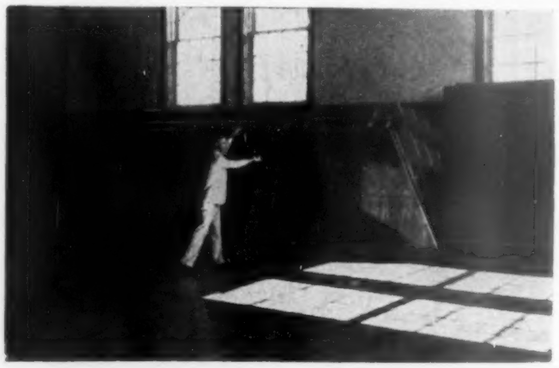
TYPE "H" PORTABLE GRANDSTAND

This WAYNE stand is built to give large capacity at low cost. It is not as easy to move as the Type "C" or the Type "G," although a unit of six rows or less can be moved indoors or outdoors without dismantling. It is a wise choice if your stand need not be moved frequently. The Type "H" is built in any number of rows from 3 to 15. Erection is easy. No foundations are necessary, and the stand is strong and rigid.



TYPE "C" PORTABLE GRANDSTAND

The WAYNE Type "C" Grandstand is designed for use when space is limited and when the stand must be moved to various locations, indoors or outdoors. It is the most readily portable and the easiest to erect of all WAYNE stands. The stand can be built with any number of rows from 3 to 16. No foundations are necessary. No nuts, bolts, screws or special tools are required for erection.



FOLDING GYMSTAND

The WAYNE Folding Gymstand has primarily the same function as the Rolling Gymstand. It provides roomy, comfortable, easy-to-see-from seats when open. When not in use, it folds snugly against the wall, as shown above, and provides additional floor space. The cabinet front is neat and functional—eliminates the need for costly wainscoting. Built in rows from 3 to 12, it can be recessed in the wall if desired.

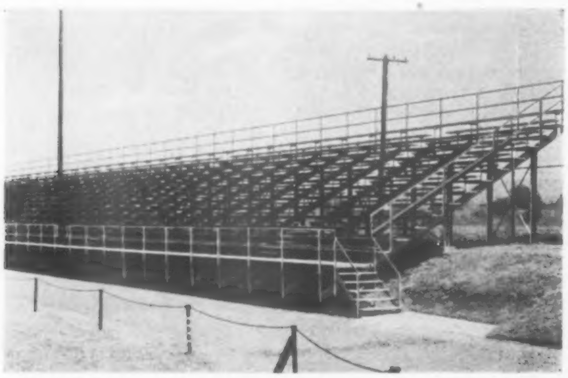
"Wayne Stands for Safety" WAYNE IRON WORKS, 544 N. Pembroke Avenue, Wayne, Penna.

MOVABLE, ROLLING GYMSTAND

The Movable Rolling Gymstand for indoor use is designed to be moved from place to place. It rolls together when not in use to save many square feet of valuable floor space. One man opens or closes it, quickly and easily. The stand is moved by means of two two-caster trucks or dollies—can be stored if necessary. It is made in any number of rows from 3 to 14.

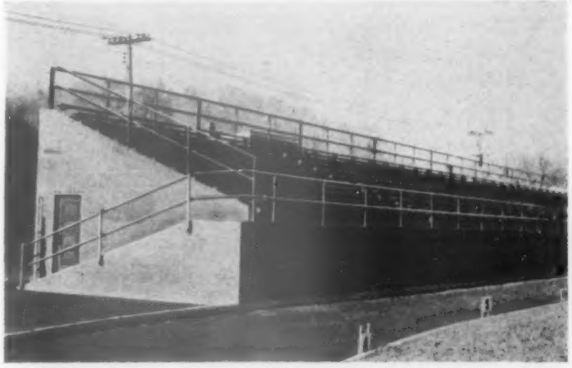
STANDARD, ROLLING GYMSTAND

This stand, like the Movable Rolling Type, is designed to save floor space by rolling together when not in use in the gym. It is permanently positioned, but does not depend on the wall for stability. One or more rows may be opened for use while the rest of the rows, from 3 to 22, remain closed. It provides safe, comfortable seating and has a large capacity.



TYPE "BC" OPEN-DECK GRANDSTAND

This grandstand, like all permanent grandstands, is usually designed to fit the particular needs of the customer. It can be elevated or not, as desired. The Type "BC" is built in any number of rows up to 50—is open-deck in construction. Supports are sturdy steel, while seatboards and footboards are made of wood. The steel structure permits expansion, contraction and settlement without stress and with absolute safety.



TYPE "BP," STEEL-DECK GRANDSTAND

The Type "BP," like the Type "BC" is usually designed to individual specifications with the number of rows depending on the customer's desires. It differs from the Type "BC" in that steel plates are used to provide a water-proof stand, under which locker rooms, toilets, etc., can be built. Wooden seatboards are provided and are bolted to the steel plates. It can be elevated, if desired, in which case entrance stairs are installed, usually at front.

WAYNE STANDS AND SAFETY

In buying or specifying a Wayne Grandstand or Gymstand, you may be sure of one important fact—your installation, whether it be a small, portable stand or a twenty-five thousand seat stadium, is the product of over 26 years of progressive engineering practice devoted to the design, manufacture and erection of grandstand equipment for schools, colleges, municipalities and industrial concerns throughout the country.

And you are assured of absolute safety. All Wayne Grandstands are designed and constructed to conform to the exacting requirements of the Safety Code for Grandstands of the American Standards Association, the Grandstand Regulations of the Commonwealth of Pennsylvania and the Standard Specifications of the American Institute of Steel Construction. Stresses in wood conform to the recommendations of the United States Forest Products Laboratory. Dead load, live load, sway load and wind load are all provided for with a wide margin of safety.

REMEMBER — any additional information or advice will be gladly given you upon request. Just write to Wayne Iron Works, Wayne, Penna.

WAYNE IRON WORKS, 544 N. Pembroke Avenue, Wayne, Penna. ***"Wayne Stands for Safety"***

WILLIAMS IRON WORKS, INC.

Designers, Manufacturers and Erectors of Steel Grandstands

Permanent and Portable • Indoor and Outdoor • Folding and Rolling

430 East 102nd Street New York 29, N. Y.

TELEPHONE: ATwater 9-8610

Start Planning Now with WILLIAMS

If you are planning for new grandstands—or additions to existing equipment—discuss your needs with Williams.

The Williams engineering staff with more than 30 years of practical experience in the design, manufacture and erection of indoor and outdoor steel seating equipment is ready to put this knowledge to work for you—to help you select the type grandstand best suited to your needs and budget. Our experience ranges from the manufacture and erection of double-deck and large canopied stadiums seating up to 20,000, down to the smallest portable grandstand.

Engineering Skill Plus Specialized Experience

Williams Grandstands are designed and built to meet your specific conditions but for maximum economy several standardized types have been developed. All incorporate the famous Williams 4-to-1 factor of safety which exceeds all code requirements and cuts insurance rates "to the bone."

Correctness of design, the use of only materials that conform to code requirements and workmanship that is cognizant of the responsibility for the safety of spectators, are factors that make every Williams Steel Grandstand safe, practical and economical. You are assured of a stand which, with a reasonable amount of care, will last as long as any modern school plant—be a credit to the school and its community—and measure up to the high standards established in hundreds of previous Williams installations.

For further details we suggest that you write to this office for literature and the name of our local representative. He will consult with you on your plans and provide any desired assistance without obligation.

WILLIAMS Guarantee

Bear in mind also that Williams Grandstands are guaranteed. We agree, within two years to pay you one-half of the purchase price should you want to dispose of the stands we erect. In the event you wish to increase your seating capacity we will take your old stands and allow you a substantial credit on new Williams Grandstands. It will pay you to consult now with Williams.

Permanent

Many large permanent steel grandstands—open, canopied and double-decked—have been constructed by the Williams organization. The permanence of these Williams installations make them a lifetime investment. Their design flexibility permits adaptation to your individual needs.

Williams Permanent Steel Grandstands and Stadiums have the comfort, unquestioned strength of construction, simplicity of maintenance, fine appearance that make them a valuable addition to any educational institution. The only maintenance necessary is an occasional coat of paint, which keeps them looking new year after year.

Our staff of engineers will furnish comprehensive information upon receipt of detailed information covering your needs.

Specifications for Permanent Steel Grandstands

Steel—Steel, whenever used, shall conform to the Standard Specifications of the American Society for Testing Materials for Structural Steel for Buildings A-9 as amended to date.

All structural members shall be not less than 1/4 in. thick, except for the web of rolled structural shapes which shall be not less than seventeen one-hundredth (.17) of an inch thick.

Columns to be 8 in.; spaced 18 ft. on center.

Channel stringers to be 12 in.; 6 ft. on center.

Foot board supports to be 2 x 2 x 1/4-in. angles, riveted and welded to channel stringers.

Framing to support channel stringers to be 12 and 15-in. I-beams.

Diagonal and longitudinal bracing to be of 1-in. rods.

Railing to be of pipe and angles.

All shop connections to be riveted and field connections to be bolted.

Lumber—Seat boards to be 2 x 10-in. Clear Oregon Fir dressed on sides.

Foot boards to consist of two 2 x 10-in. Clear Oregon Fir dressed on four sides.

All to be bolted to structural steel members by 5/16-in. carriage bolts.

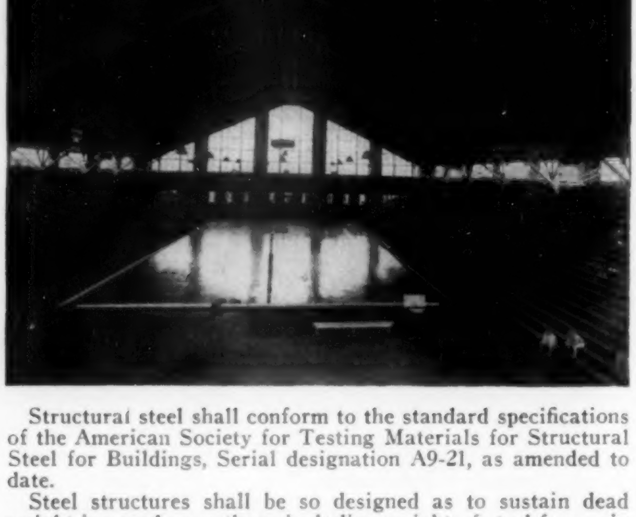
Painting—All steel and lumber to be painted one coat of paint in the shop and one field coat.

Portable

Williams Portable Steel Grandstands are recommended where limited budgets are involved. They are made in economical 16-foot standardized units.

Specifications for Portable Type Grandstand

Stands shall consist of seat and foot boards, supported by structural steel stringers and angle supports, riveted to stringers, held in position by vertical bents. No loose parts or bolts used.



Structural steel shall conform to the standard specifications of the American Society for Testing Materials for Structural Steel for Buildings, Serial designation A9-21, as amended to date.

Steel structures shall be so designed as to sustain dead weight imposed upon them, including weight of steel frame, in addition, a live load of 125 lbs. per sq. ft. of horizontal projection. Proper provision is to be made for temporary stress, caused by erection.

Stringers—Stringers shall be channel steel, not less than 4-in. channel. Bottom end of stringer shall have bearing plate welded to same for resting on the floor or ground.

Seat and Foot Board Supports—Supports shall not be less than 2 x 2 x 3/16-in. steel angles, riveted to stringer, forming one complete unit. Tops of angle support shall be slotted to receive lip of locking device.

Seat and Foot Boards—Seat and foot boards shall be made of selected Oregon fir. Boards to be not less than 1⅝-in. thickness. Seat Boards shall be 9½ in. wide, and have all sharp edges rounded. One foot board 12 in. shall be in uniform lengths of 16 ft., unless otherwise specified. All seat and foot boards shall have locking device attached to the underside, for fastening boards to supports, insuring absolute rigidity. Seats shall be spaced not less than 22 in. back to back. Height of seat above foot board shall be not less than 17 in. and the rise per row shall be not less than 8 in.

Locking device to be made of sheet steel plate 3/16 x 3 x 8 in. riveted to underside of seat and foot boards.

Bents—Bents shall consist of two vertical struts of 2½ x 2½ x 3/16-in. angle steel, braced horizontally and diagonally to insure rigidity against side sway, tops of each strut shall have proper provision for receiving stringers. Bearing plates, 6 x 6 x ¼ in. to be welded to foot of each bent, for resting on floor or ground. Horizontal and diagonal braces to be not less than 2 x 2 x 3/16-in. steel angles, and shall be welded to struts.

		2 Rows	3 Rows	4 Rows	5 Rows	6 Rows	7 Rows	8 Rows	9 Rows	10 Rows
Total Depth		3'—7½"	4'—5½"	6'—3½"	8'—1½"	9'—11½"	12'—3"	14'—1"	15'—11"	17'—9"
Height Top Seat		1'—10"	2'—4⅝"	2'—10¾"	3'—5⅛"	3'—11½"	4'—6½"	5'—1½"	5'—8½"	6'—3½"
Length	No. Units	SEATING CAPACITY								
16'	1	24	36	48	60	72	84	96	108	120

Seating capacity based on a width of 16" per seat, can be determined by multiplying the number of units by the figures indicated above.

Folding

The Williams Folding Grandstands save many square feet of useable floor space by folding out of the way when not in use. They make smaller, less costly buildings practical and allow for two practice cross-courts without sacrificing spectator seats. Perfectly counterbalanced they open and fold with one easy operation. Built in 16' standardized units up to 10 rows high. An eight row stand folds to a compact 2' 2" space, yet when open provides roomy, comfortable, easy-to-see from seating.

Specifications for WILLIAMS Folding Stands

1. **TYPE**—Grandstand Units shall consist of two articulated sections the upper section being secured pivotally to the wall, the lower section being secured pivotally to the upper section, both sections being provided with linkage systems which regulate the folding motion. The primary structure supporting the seat and foot boards shall consist of two or more units per section to which are attached seat boards, foot boards, folding guard rails, face panel and one set each of the above linkage and bracing units.

2. **LOCKING DEVICE**—An automatic locking device for securing the stringer units in an open (unfolded) position shall be provided for each individual unit. The lock operating mechanism may be manipulated by an operator with one hand, while standing on the floor, clear of the stand. A padlock shall be provided, which will prevent tampering with the opening and closing of the locking device by non-authorized persons.

4. **MATERIAL**—The stand shall consist of commercial steel structural supporting members, commercial steel bar links and braces, clear, comb-grained Douglas Fir seat and foot boards of solid stock, as may be selected, to measure 9' x 1 1/16" finished, and to have all edges and corners eased. Rubber footpads at bearing points on floor shall be provided to prevent marring of floor. The Mason Contractor shall build in wall anchor bolts as detailed and furnished by this Contractor.

5. **PERFORMANCE TESTS**—The structure shall be designed to withstand loads equal to at least two times the basic live load of 150 lbs. per 17" of available seat space, plus the dead weight of the stand. The stand shall be operated according to the size, by one or more persons, entirely from the front side.

6. **WOOD ENCLOSURE**—Wainscoting shall be made of best grade 5-ply Douglas Fir ½" thick, fastened to the bottom edges of front members of each stringer, and shall be approximately 6" from floor for ventilation. When stand is in folded position, wainscoting shall form a flush protective wall. At no time shall the face of wainscoting panel come in contact with the floor.

7. **FINISH**—All steel parts, except operating surfaces, shall receive prime coat and one coat of best grade enamel. Wood parts shall receive one coat of stain, one coat of sealer, sanding and one coat floor varnish.

8. **DIMENSIONS**—When Open / When Folded. Rise Per Row 11"

Rows	When Open Height	When Open Depth	When Folded Height	When Folded Depth
4	4' 2"	6' 7"	4' 2"	24"
5	5' 1"	8' 4"	5' 1"	24"
6	6' 0"	10' 4"	6' 0"	24"
7	7' 1½"	12' 0"	7' 1½"	27"

Distance between rows, back to back for all stands, 22".

WILLIAMS Park Bench

These attractive steel and oak benches will outlast conventional types. Supplied in two models—one a three-legged bench, 6′ x 2′ 6″; and the other a two-legged unit, 4′ x 2′ 6″. Shipped knocked down to reduce transportation costs. Anyone can assemble them by inserting and tightening a few bolts, supplied with bench. Immediate delivery. Write for quotation.

A Few Typical WILLIAMS Grandstand Installations

Indiana University	Bloomington, Ind.	50 rows
Unversity of Kentucky	Lexington, Ky.	30 "
Cornell University	Ithaca, N. Y.	30 "
Springfield College	Springfield, Mass.	30 "
University of Georgia	Athens, Ga.	20 "
University of Tennessee	Knoxville, Tenn.	20 "
Duke University	Durham, N. C.	24 "
Muhlenberg College	Allentown, Pa.	16 "
Hamden High School	Hamden, Conn.	15 "
Arthur Hill High School	Saginaw, Mich.	17 "
Plainfield High School	Plainfield, N. J.	15 "
Wofford School	Spartansburg, S. C.	10 "
Boston Club	New Orleans, La.	14 "
Atlantic Rural Exposition	Richmond, Va.	16 "
Bronxville Public School	Bronxville, N. Y.	12 "
Ice Exhibition	Caracas, Venezuela	15 "
Bone Stadium	Pittston, Pa.	10 "
Central High School	Knoxville, Tenn.	20 "
City of St. Augustine	St. Augustine, Fla.	10 "
Franklin High School	Franklin, N. H.	10 "
Ridley Township School Dist.	Folsom, Pa.	10 "
Laureldale High School	Laureldale, Pa.	9 "

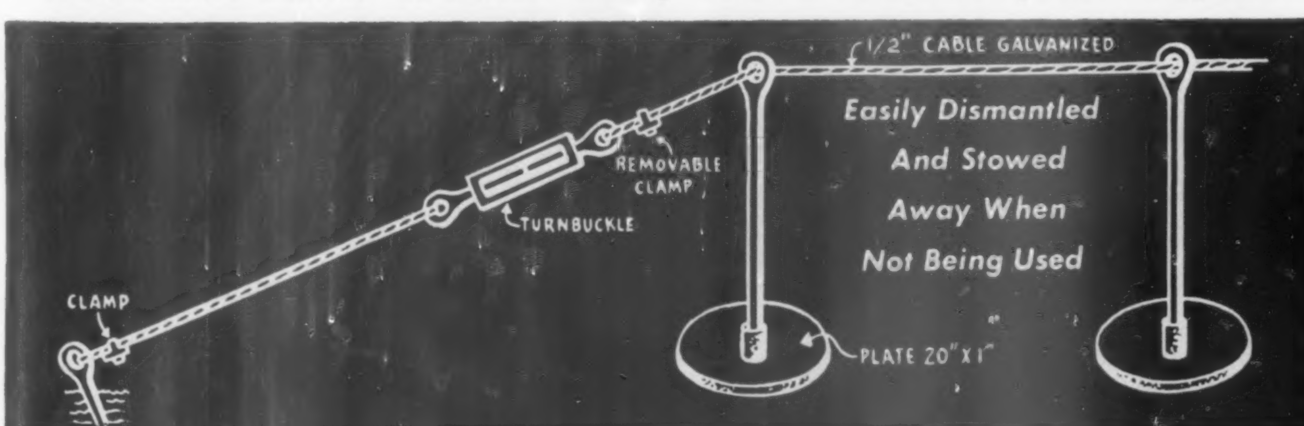
SIMPLE, INEXPENSIVE WAY TO KEEP FANS OFF PLAYING FIELD

Here is a simple, practical, inexpensive way to keep spectators off the playing field—to prevent them from interfering with the play and to save wear and tear on the field. When not in use, this simple restraining apparatus is easily dismantled and stowed away.

The stanchions are made up of plate 1″ thick by 20″ in diameter. To the plate is welded a 36″ rod with holes provided to thread the ½″ wire cable. Stanchions should be spaced approximately 50′ apart on the field. Ground spikes to anchor cable ends are about 24″ long. Turnbuckles are used to tighten up the wire cable after it is in place.

Write giving details on your requirements for price quotation.

WILLIAMS IRON WORKS INC., 430 E. 102nd St., N.Y. 29, N.Y.



CROUSE-HINDS COMPANY

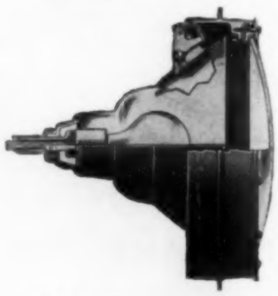
Syracuse 1, N. Y.

Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis
New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington. *Resident Representatives:* Albany — Atlanta — Charlotte — New Orleans
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

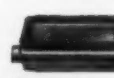
Type MUA Alumalux Floodlight provides adequate light at minimum first cost

Type LCE-1120 Heavy Duty Long Range Floodlight gives perfect light control and low maintenance cost

Type GCP, an ornamental lantern by day, a powerful floodlight at night.



Type SPS Swimming Pool Floodlight — Sectional View



Type FS for lighting steps, floors, walks, and gardens

FLOODLIGHTS
for sports and campus lighting

Sports Lighting

Pioneer in sports lighting, Crouse-Hinds has a wealth of experience acquired through more than twenty years of planning the most efficient lighting for all types of playing fields from small playgrounds to huge stadiums. This "know how," teamed up with Crouse-Hinds Type MUA Alumalux Weatherproof Floodlight forms an unbeatable combination that you can use to get the greatest amount of light out onto your playing field where it does the most good. Type LCE-1120 Long Range Floodlight is the most efficient unit for use where it is necessary to place the floodlights at a considerable distance back from the playing area.

Swimming Pools

Type SPS Floodlight is especially designed for the underwater lighting of swimming pools. It can be installed in a passageway around the pool wall or in a small manhole. Type RPS Floodlight is for use where space is limited. Three different types of Crouse-Hinds floodlights are suitable for the overhead lighting of outdoor swimming pools: Type MUA Alumalux, Type ADE Long Range, or Type GCP Ornamental Lantern Floodlights.

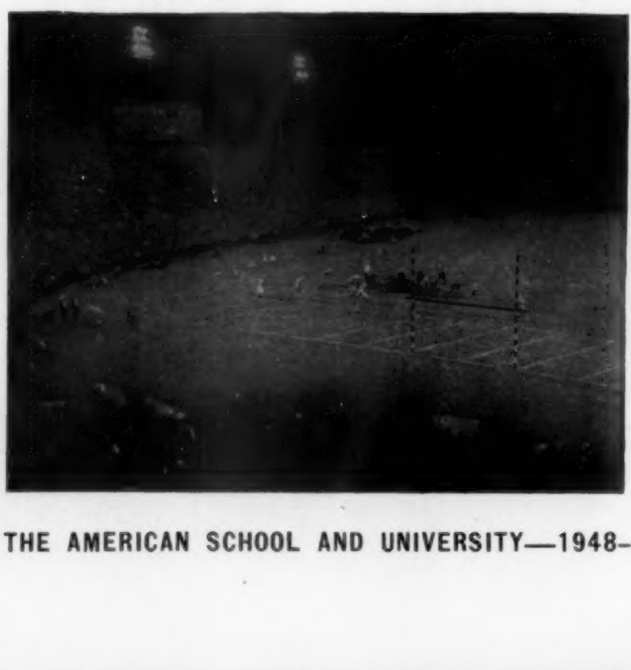
Decorative Campus Lighting

There are many opportunities to make any campus more attractive by using concealed Crouse-Hinds floodlights to project either white or colored light on fountains, gardens, statuary, towers or other architectural details. When the floodlight is in the line of vision, beauty can be combined with utility by using Type GCP Ornamental Lantern Floodlight. Type FS Lighting fixture is suitable for low-level lighting.

General Floodlighting

Auto parking lots are most efficiently lighted by the use of floodlights. There are many other areas on every campus where it will cost much less to project light to a considerable distance with Crouse-Hinds long range floodlights than to run cables and install local lighting. Often the floodlights can be mounted on buildings, thereby saving the cost of poles or towers.

Crouse-Hinds lighting engineers will recommend the proper selection and arrangement of floodlights for any application. Send drawings and details. Bulletins covering NEMA standard plans for the lighting of baseball, football and softball fields are available.



GENERAL ELECTRIC COMPANY

APPARATUS DEPARTMENT

Schenectady 5, N. Y.

A better floodlight for your sportsfields!

An ideal floodlight for sportsfields, designed to provide highly efficient, uniform illumination free from objectionable glare.

The L-69 floodlight has an outstandingly high beam efficiency and provides superior utilization of light — superior to any other sport light in use today.

Other significant features include a spun-in glass front of Tufflex tempered, impact-resisting glass. Rifle sights and horizontal and vertical degree scales are included to make accurate alignment easy.

For complete information on this floodlight, call your nearest G-E sales representative or Apparatus Agent. For assistance with any sports or recreation field lighting problem, write the Apparatus Department, Schenectady 5, N. Y. See pages 585-592 for General Electric Educational Services.

HIGH EFFICIENCY IS EASILY MAINTAINED

1. Servicing is as simple as A B C! First, release the two quick acting toggle latches which secure the socket housing to the reflector collar

2. Now—and without any need whatsoever for moving the reflector—lift off the socket housing and the lamp. It weighs only four pounds

3. Next, slip this heavy stainless steel clip over the trunnion bracket as shown in the next illustration

4. And now, **with both hands free,** you're ready to service the light. Note that the auxiliary reflector is rigidly mounted

5. See how easily you can clean the reflector without tilting it

6. Tilting the reflector is easy if it ever becomes necessary. No tools required and reflector always returns to its original position

GENERAL GE ELECTRIC

AMERICAN PLAYGROUND DEVICE CO.

World's Leading Manufacturers of the Finest in Outdoor Playground, Swimming Pool and Dressing Room Equipment

Anderson, Indiana, U. S. A.

☆ ☆ ☆ **In Playground Equipment experienced buyers demand durability, absolute safety, proven performance, long service. It is reasonable that only *highest quality* equipment will give you these vitally important features.**

AMERICAN APPROVED
Playground Equipment

meets *every one* of your requirements. Modern design . . . top quality materials . . . unexcelled workmanship . . . maximum safety . . . superior performance . . . these are but a few of many *plus-features* you receive when you install pre-war quality *American Approved* Equipment.

☆ ☆ ☆ **WRITE TODAY,** ***please, for Catalogs and descriptive Literature. See why AMERICAN has led the field for more than thirty-eight years, why*** **American Approved** ***Equipment outperforms all others.***

AMERICAN

PLAYGROUND DEVICE CO.

ANDERSON, INDIANA

World's Largest Exclusive Manufacturers of Fine Playground and Swimming Pool Equipment

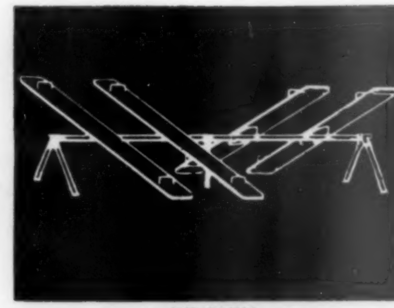
SWING SETS • PLAYGROUND SLIDES • SEE-SAW UNITS • HORIZONTAL LADDERS
MERRY-GO-ROUNDS • GIANT STRIDES • RUBBER SWING SEATS • PICNIC TABLES
BICYCLE RACKS • BASEBALL BACK STOPS • CASTLE TOWERS • PARK SETTEES
COMBINATION UNITS • CHAIN LINK TENNIS NETS • HEAVY DUTY REPAIR PARTS

THE J. E. BURKE CO.

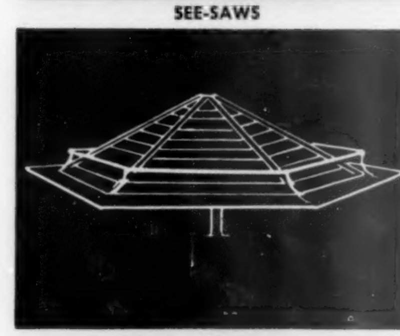
Fond du Lac, Wisconsin

BURKE PLAYGROUND EQUIPMENT

for young Americans



SEE-SAWS

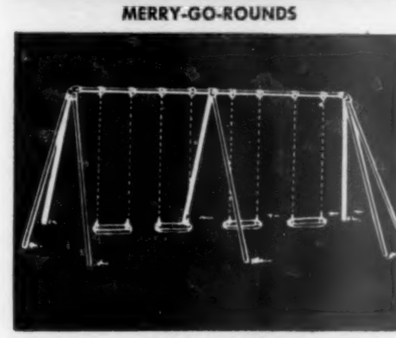


MERRY-GO-ROUNDS

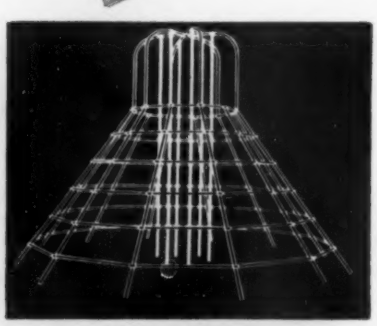
Children Now! but in a few years . . . leaders of your community or the nation. These young Americans need protection and safety in play to help them build strong bodies. Burke-Built playground equipment is a worthwhile playtime investment—it is constructed of only the best quality materials, and is scientifically designed to provide maximum safety and healthful exercise for children, together with long service and low maintenance cost.

The Burke-Built line includes Climbing Structures, Swings, Slides, See-Saws, Merry-Go-Rounds, Turning Bars, Horizontal Ladders and many other items.

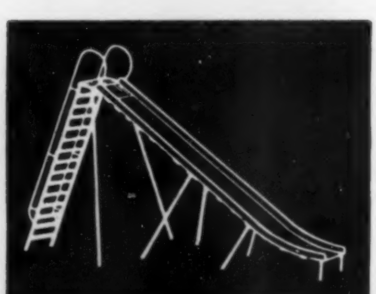
Send for 60-page Catalog with complete information to help you plan and choose proper playground apparatus. It shows structural detail, special fittings, various models, sizes, combination equipment and replacement parts.



SWING SETS

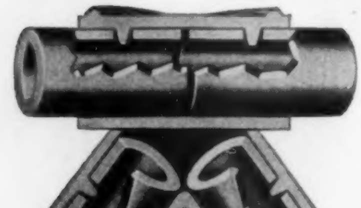


CLIMB-A-ROUNDS

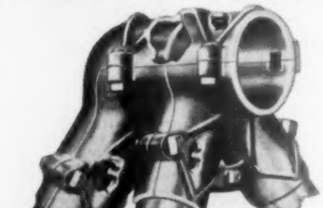


SLIDES

DURABLE, STRONG FITTINGS MAKE BURKE-BUILT EQUIPMENT SAFER!



INTERLOCKING KNOB in split clamp fitting provides safest, most positive construction — **PREVENTS** twisting, sagging, misalignment.



HEAVILY RIBBED reinforcement gives the Certified Malleable iron frame fittings lasting strength at vital points—insures safety.

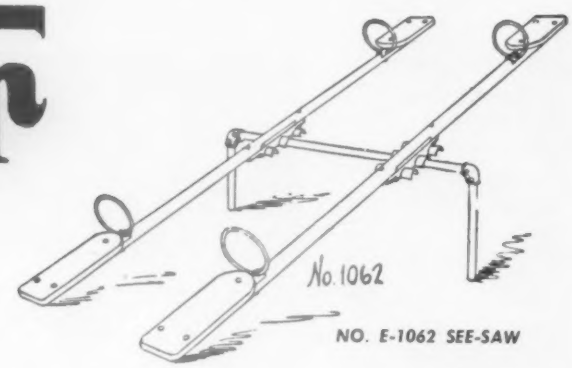
THE J. E. BURKE CO.

FOND DU LAC, WISCONSIN

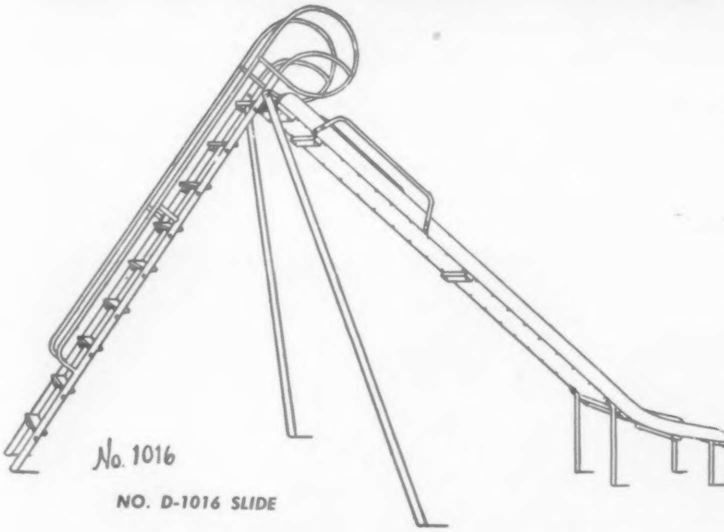
THE EVERWEAR MANUFACTURING COMPANY

Springfield, Ohio

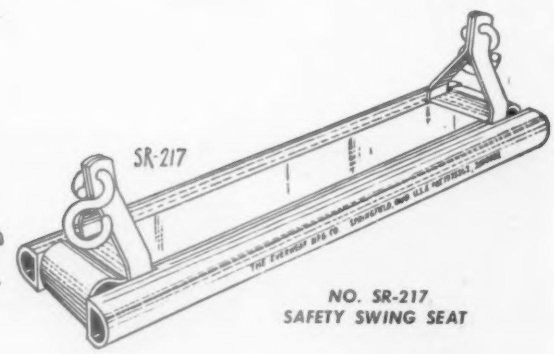
EverWear



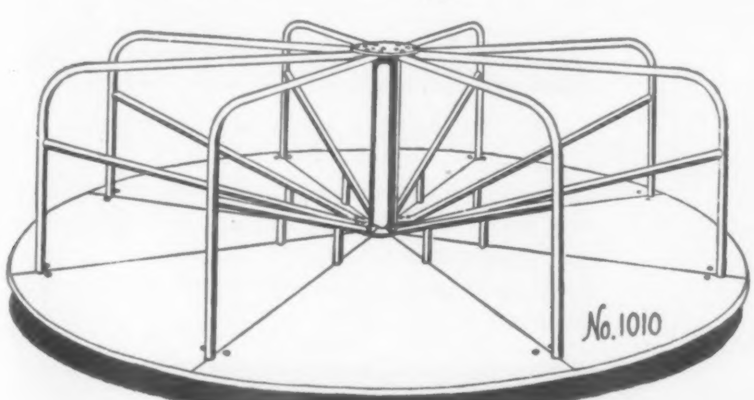
NO. E-1062 SEE-SAW



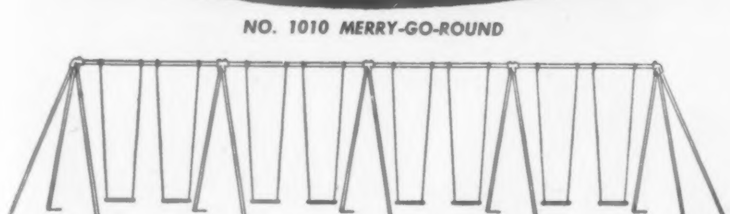
NO. D-1016 SLIDE



NO. SR-217
SAFETY SWING SEAT



NO. 1010 MERRY-GO-ROUND



NO. J-300 SWINGS

FOR 40 YEARS, The EverWear Line of Recreation Apparatus has been serving the children of the world with the SAFEST recreation obtainable.

Its Playground Line has been recognized and adopted for its safety, durability, beauty, and playability by Schools, Cities, and Children's Institutions the world over.

In addition to its world-famous EverWear Playground Apparatus, the EverWear Line now includes Swimming Pool Equipment and Basket Ball Backstops.

Your letter of inquiry will receive our complete catalog and any specific data you may require.

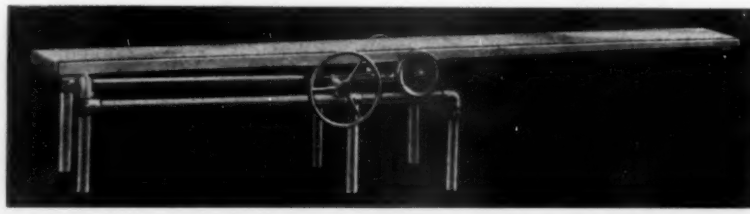
Basket Ball Backstops, both outdoor and indoor, Chain Suspensions, Child Climb, Climbing Outfit, Combination Outfit, Flag Staffs, Frame Fittings, Giant Strides, Hanger Clamps, Horizontal Bars, Horizontal Ladders, Kindergarten Rocking Boats, Kindergarten Slides, Kindergarten Swings, Merry-Go-Rounds, Merry-Wave-Strides, Ocean Waves, Parallel Bars, Racer Slides, Rings, See-Saws, Tether Tennis Posts, Trapeze, Volley Ball Posts, Swimming Pool Equipment.

RECREATION EQUIPMENT CO.

724-26 West Eighth Street, Anderson, Indiana

Manufacturers of Playground, Swimming Pool and Basketball Equipment

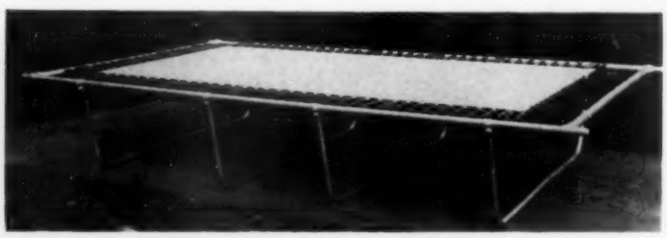
For Beach and Pool—Diving Board Outfits, Ladders, Pool Cleaning Equipment, Diving Mask Outfits, Slides, Cocoa Matting, Foot Trays, Umbrellas, etc.



For the Playground—Swings, Slides, Merry - Go - Rounds, Gym Combinations, Monkey Jungles, Outdoor Basketball Equipment, etc.

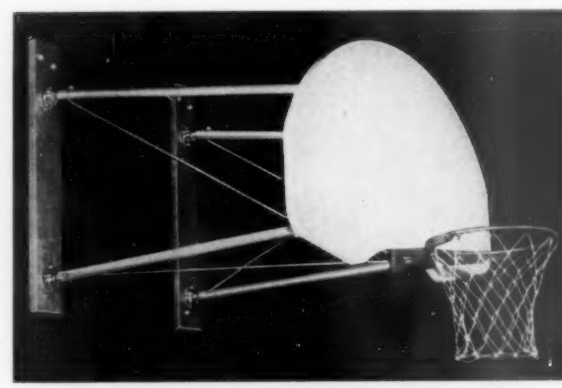
DIVING BOARD, USING IMPROVED QUICK-ADJUSTABLE FULCRUM

Acknowledged as the best fulcrum, especially for championship use.
Four of these fulcrums specified and were installed in the pool at Detroit, for use in the final try-outs for the 1948 Olympic Games in London. A well-deserved recognition.



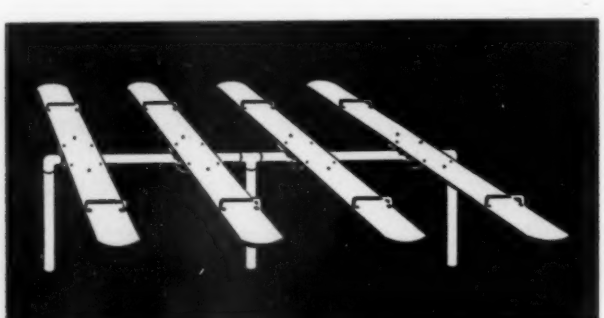
RECREATION BOUNCER

This tumbling device offers a lot of fun and exercise, and admits of a great number of stunts. It is very strongly built, with a heavy frame, made of galvanized pipe and malleable fittings. The canvas is very heavy, of double thickness, and reinforced. It is supplied with rings and springs.



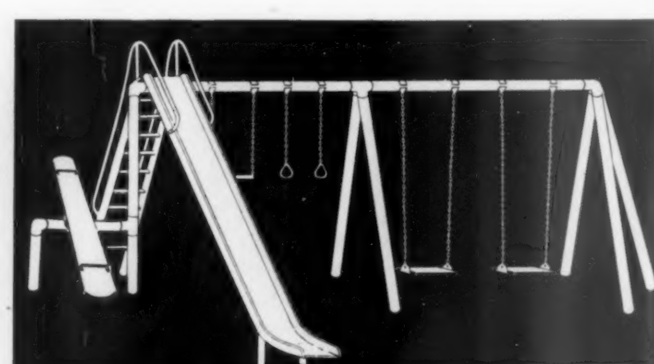
BASKETBALL BACKBOARDS, GOALS AND FRAMES

Backboards are made of plywood, for both rectangular and fan-shaped types, and the fan-shaped also made of all-steel. A variety of types of frames, or mountings, including wall, swing-up and portable.



SEE-SAW OUTFITS

Several types of frames may be had.



GYM COMBINATIONS

A great variety of combinations is offered.

WRITE FOR FREE CATALOG

MAINTENANCE PRODUCTS AND BUSES

Janitors' Supplies
Plumbing Maintenance Tools
Washroom Sanitation
Floor Machines
Floor Treatments
Vacuum Cleaners
Grounds Maintenance
Lawn Mowers
Fence
School Buses

FLOOR MAINTENANCE PROGRAMS

BY CHURCHILL

Floor Maintenance results depend upon a properly co-ordinated maintenance program. Preparation, finishing, special treatment, protective dressing, cleaning, and daily sweeping all contribute to the final result. The satisfactory result may be lost by an error in any part of the complete procedure.

Analysis of the *nature, maintenance principle,* and recommended *maintenance program* is here presented for different type floor problems. Each floor has a different personality which must be considered to obtain a desired result. The programs here suggested are the result of twenty-five years' engineering. Each has been proven and tested.

Well-trained maintenance engineers are available, without obligation, to personally survey and counsel on your maintenance programs and problems.

Write for information or request our maintenance engineers to call.

CHECK YOUR METHODS WITH THESE PROGRAMS

Wood Floors • Heavy Traffic Type

NATURE:

Several types of wood flooring are common. Maple, oak, pine and fir are most popular for this type floor. The chief difference is porosity and hardness. The wood pulp space between sap lines of the grain of the wood is wider and softer in soft woods. Without protection, the alburnum or life and beauty of the wood is washed away by mopping and scrubbing. Water tends to rot and deaden. Stains and discoloration accumulate and soon a dead, weather beaten result develops.

MAINTENANCE:

Heavy traffic wood floors should be sealed to the surface with a penetrating sealer. That is, the space between sap lines should be filled and made tough and nonabsorbent with a good sealer. The method is the same for hard and soft woods, except that soft woods require more coats and permit less square foot spread per gallon, due to porosity. Do not use surface seals or mopping varnishes. These lie upon the surface of the floor and are quickly worn off in traffic lanes. The sealer is only to preserve and protect the wood. The protection from wear and abuse comes from the wax or floor dressing used upon the sealer. Soft waxes are worse than no wax since they attract and hold grit which settles to the sealer and soon grinds it off. A good sealer is important, but the type of wax and the maintenance program is even more important for economical results.

MAINTENANCE PROGRAM:

Apply Trans-I-Lac or Bindex with chenille applicator lengthways of wood. New or freshly sanded maple requires two coats; oak two coats after it has been filled with paste filler; pine and fir require three coats. Old floors of all kinds need an extra coat. Allow 6 to 8 hours for each coat to dry.

To Clean: Rough, unlevel floors should be sanded before applying a good permanent finish such as Trans-I-Lac or Bindex. After cutting level, finish with fine paper and remove dust with several sweepings. Finish and wax may be removed with a thorough scrubbing of one pound of Excel X9 to each gallon of boiling water. Follow with mopping of one pint Old Castle Neutral Soap to mop pail of water. Rinse and allow to dry thoroughly before applying sealers. For removal of wax and dirt, use only 4 to 6 ounces Master Clenzer to each gallon of water and scrub. Neutralize with Old Castle.

To Wax: Apply Aladdin or Arm-A-Cote evenly over entire floor. A wear-resistant protective wax base may be developed by repeating the process in one or two weeks. From then on, apply Aladdin when and where needed along traffic lanes to maintain the protective coat. If machine is available, polish often. Aladdin is a hard wax and will keep dirt and grit on its surface.

A polishing brush will remove grit and maintain a high polish. Use Nu-Glo as described under Asphalt Tile Floors between waxing if desired. Use Old Castle Neutral Soap to clean between waxing when necessary.

Sweep with Mop-Cote or Push Mop slightly dampened with Nu-Tone.

Asphalt Tile Floors

NATURE:

Asphalt tile, being pressed asphaltum and oil, is extremely sensitive to alkali, acids, and solvents. Thus any soap, cleaner, wax, or finish containing either of the above will fade, bleed, or destroy same. Asphalt tile blocks are laid in an asphalt pitch. Wrong cleaning methods may loosen. The tile is brittle when cold and will crack easily. When warm, it is soft and will dent, bend, and is more easily injured.

MAINTENANCE:

Asphalt tile should always be protected with a hard neutral or water emulsion wax. Never use paste or spirit waxes. Never use soft wax. Soft wax absorbs grit and dirt. Dirty wax must be washed off and thrown away. This is expensive. Grit penetrates soft wax, causing wear of asphalt tile beneath wax. Soft wax creates sandpaper effect under traffic. Soft wax is also too slippery for asphalt tile. **Use a hard wax only.**

On asphalt tile gymnasiums and such floors which are impractical to wax, create a protective hard film in another manner. (See Nu-Glo System below.)

Use only the most neutral cleaners on asphalt tile.

MAINTENANCE PROGRAM:

To Clean: Use from one-half to one cupful of Old Castle or P & V neutral soap per pail of water.

To remove dirty wax, use Skram mixed with equal parts water.

In all cases, rinse clean with clean mop and water.

To Wax: Apply Aladdin or Hi-Glow with chenille or sheep's wool applicator. Apply thinly, spread quickly, and allow to dry 18 minutes. Do not build thick wax coatings. Re touch traffic lanes as needed. The most economical and most satisfying results are obtained by buffing often with a machine. Wax may be dry cleaned and repolished by using stiff brush or fine steel wool under machine brushes.

Nu-Glo System:

It is not practical to wax gymnasiums, restaurant, chain store, or lobby floors. Use Nu-Glo in mop water when floors need mopping. Nu-Glo cleans, protects, and improves appearance in the same operation. Clean with Nu-Glo between waxings.

Sweeping: Sweep the floor with Mop-Cote or Push Mop which has been slightly dampened with Nu-Tone.

Gymnasium Floors

NATURE:

Three important results must be obtained on a gym floor—nonslipperiness for speed; non-rubber-burning for appearance; and toughness for long wear. To accomplish the above, the finish must lie upon the surface. A pure bakelite gym finish produces the best results. Ordinary sealer or varnish does not have sufficient elasticity and has too low a melting point for shoe friction. It must be remembered that the wear and traffic comes on the finish.

MAINTENANCE:

A light transparent finish must be maintained at all times. Finishes which turn dark must be removed before refinishing. Light finishes remain permanently and do not emphasize worn spots. Nothing should be used to create a slippery condition at any time. Gyms may be maintained simply and cheaply if the right program is followed. Ballrooms, parlors and other floors may be waxed as described under Wood Floors.

MAINTENANCE PROGRAM:

After floor has been sanded smooth and even and dust carefully removed, apply one coat of Romp-On Filler with applicator. When dry, mark and paint court lines with Churchill's Bakelite Line Paint. Then apply three consecutive coats of Romp-On Gym Finish. On Ballroom and parlor floors, good results are obtained with three consecutive coats of Romp-On.

To Clean gym floors previously finished, scrub with Skram to clean off shoe marks and dirt films. Master Clenzer will also clean thoroughly. Neutralize with Old Castle after using Master Clenzer.

Refinish as and when needed by cleaning floor thoroughly, then applying one or two coats of Romp-On.

For Dancing, use Prom Dance Wax to make floor slippery enough. After dance sweep well, then mop off remaining Prom using either Skram or Old Castle in water. Never use ordinary Dance Wax on a Gym.

Remove Shoe Marks with Skram. Skram may be sprayed or mopped on marks. Allow to stand 3 to 5 minutes then mop or scrub clean.

Sweep with wide Mop-Cote or Push Mop slightly dampened with Romp-On Cleaner. Some prefer to spray Romp-On Cleaner over floor, then rub off excess with dirt.

RESULTS DEPEND UPON CORRECT PROGRAMS

Cement Floors

NATURE:

Cement is a mixture of sand and crushed limestone. When dry it is 65 per cent porous. The cement is full of alkaline salts. Generally cement is laid upon the ground. The difference in temperature causes a capillary attraction and draws moisture up through its pores. Alkaline salts come with it. These salts attack any paint or finish with an oil nature inasmuch as a saponification occurs. The moisture held by cement affects the adherence of many sealers and finishes. Cement constantly dusts out. If permitted to continue, same increases to the point of wear.

MAINTENANCE:

All cement should be sealed to stop dusting. When properly sealed or painted, it may be treated as any other flooring.

MAINTENANCE PROGRAM:

To Seal: Wash with strong solution of Old Castle Soap to neutralize and float off all dust. Rinse with clean water and permit to dry. Apply two coats of Bindex with applicator. Old floors may require third coat.

Cement Paint: Use cement paint only where color is necessary. A cement floor is maintained much more economically with sealer containing no color. To remove old cement paint, use 1 pound Remuval to each gallon of water. Apply to floor with mop. Allow to soak for 45 minutes. Then mop off loosened paint with a heavy mop and warm water. Do not scrape or squeegee. If necessary, follow with scrubbing of Excel X9. Every cement floor should be neutralized before painting, and it is better to neutralize before sealing especially where alkali cleaners have been used. Pour one pint of concentrated Preparit into each gallon of water. Sprinkle over entire floor. Use generously and continue until foaming stops. Rinse well with clean water and allow to dry.

Apply two coats Roxite or colored Trans-I-Lac. Roxite contains a heavy content of bakelite resins and withstands more chemicals, heat and wear. Colored Trans-I-Lac is more penetrating. After two coats of color have dried thoroughly, apply one or two coats Romp-On. Romp-On will extend the life wear of any cement paint from 50 to 100 per cent.

Waxing: Wherever possible, protect sealer and cement paints with a good hard wax such as Aladdin or Arm-A-Cote.

Sweeping is always more thorough and cheaper with dust mops especially on waxed floors. Floor brushes do not remove fine grit which wears off paint and finish as thoroughly as a cotton sweeper.

Glazed Tile Floors

NATURE:

Glazed tile or vitreous tile is commonly either hexagon or square shaped, about one inch in size. Other sizes are less common. Glazed tile is only about 3 per cent porous and too hard for either sealing or waxing. These small tile often become uneven or unlevel. Thus dirt collects along lower edges while upper edge remains lighter colored.

MAINTENANCE:

Glazed tile floors are maintained only by mopping or scrubbing. They remain whiter and cleaner if a free rinsing soap is used. Some, however, prefer to use a soap which leaves a shine. Never use soap powders, powdered detergent, soap flakes or a soap containing tallow or matter nonsoluble in cold water. Such soaps and cleaners leave a film which gradually becomes gray and dirty due to the dust it collects and holds. Soap films create slippery floors.

MAINTENANCE PROGRAM:

Mop regularly with from one half to one cup Old Castle per pail of water. For removing accumulated soap film, scrub first with one pound Excel X9 to each gallon boiling water.

Sweep with high grade bristle brush or dust mop slightly dampened with Nu-Tone.

Terrazzo Floors

NATURE:

Terrazzo consists of various colored marble chips set into a base of fine cement and ground smooth. The cement is 60 per cent porous while the marble chips average about 20 per cent porous. This creates a problem in selecting a proper sealer and finish. Cement develops an alkali bloom when not properly sealed. Dusting and pitting results. As pits develop, dirt lodges in pit holes, the pits enlarge and marble chips are loosened as deterioration increases.

MAINTENANCE:

A prime sealer is recommended for every terrazzo floor whether new or old. Old terrazzo should always be so sealed. Such a prime sealer should equalize the porosity of the floor; act as a binder to marble chips and cement; fill up pores to prevent entry of dirt; and act as a base for any surface material used. A terrazzo may be kept in splendid condition by sealing with prime sealer, then mopping clean as needed. This must not be brittle. It must be totally transparent. For mopping, either use a completely free rinsing neutral soap or a neutral cleaner which leaves a shine. Some like to use self-polishing waxes.

MAINTENANCE PROGRAM:

To Clean: Use Excel X9 or Master Clenzer to remove wax, dirt or accumulated soap films, rinse with solution of Old Castle soap to float dirt from pits and to neutralize alkali bloom.

Prime Seal: Apply one or two coats of Traz depending upon porousness of floor. Cracks or worn spots should be well sealed.

Surface Seal: Apply Master Seal with mop saturated in Master Seal but well squeezed. Rub into entire surface. Start buffing with floor machine while Master Seal is still wet and buff until dry and polished. Two thin applications produce splendid results. Floor may be maintained with Master Seal by applying a coat as needed in traffic lanes.

Mopping: Use Lustrall for mopping where a shine is desired. Use Old Castle where completely free rinsing soap is desired.

Sweeping: Use Mop-Cote or Push Mop slightly dampened with Nu-Tone.

Linoleum Floors

NATURE:

Linoleum floors are a combination of oxidized linseed oil, ground cork, and color. Alkali in soaps and ordinary cleaners saponify the oils causing the linoleum to fade, become dry, brittle, and deteriorate rapidly.

MAINTENANCE:

Linoleum should be sealed with a non-brittle, penetrating sealer to prevent loss of natural oils and color. The sealer should be as resilient as the linoleum. Two methods of maintenance may be followed. Either seal and keep sealed by re-applications as needed, or seal properly and keep linoleum well waxed with hard wax. Use only neutral soaps for cleaning. Old linoleum may be restored as described below.

MAINTENANCE PROGRAM:

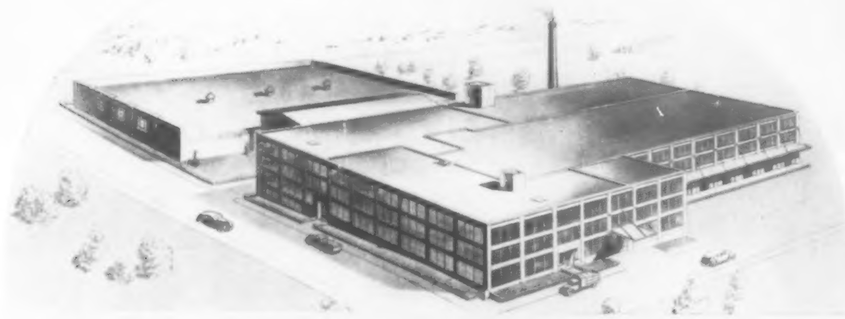
To Clean: Use Old Castle Soap, one cup to a pail of water. Scrub thoroughly. Rinse with clean water. To remove old waxes, dilute Skram with equal parts of water. Allow to soak five minutes, scrub thoroughly and rinse. Old, dry linoleum should be mopped often with generous quantities of Old Castle to feed back life.

Seal with Arm-A-Cote or Master Seal. Apply with mop. Apply one thin application rubbed well into all pores. Buff with floor machine until dry. Apply second thin application. Wait 30 minutes or longer until dry, then polish. Where machine is available, dry clean often with Arm-A-Cote. Apply slightly damp coat of Arm-A-Cote, steel wool or buff until dry and polished. Arm-A-Cote may be kept in beautiful condition if buffed often.

Wax with Aladdin, if no floor machine available, after floor has been well sealed with Arm-A-Cote, (see maintenance under Asphalt Tile Floors). Wax or Nu-Glo may be used.

Sweep with Mop-Cote dampened with Nu-Tone.

J. I. HOLCOMB MFG. COMPANY.



THE NATION'S SCHOOLS USE HOLCOMB TOOLS

They Do a Good Cleaning Job FASTER!

Each year since 1896, more and more schools have used more and more Holcomb cleaning tools and cleaning chemicals . . . because Holcomb tools cut cleaning TIME costs. Each of the nearly 500 items in the Holcomb line is built to do a specific job . . . in less time, and do it well. The ever increasing demand for Holcomb cleaning tools necessitated the new addition shown at the left (above) in 1947. The new addition at the upper right will be finished in 1948. If you have a cleaning problem, write Holcomb.

1896 — FIFTY-TWO YEARS IN BUSINESS — 1948

for

QUIET, SANITARY SWEEPING IN LOBBY, CORRIDORS, ROOMS AND ON GYMNASIUM FLOORS

For Quiet Sweeping in Corridors and Rooms

for

QUIET, SANITARY SWEEPING IN LOBBY, CORRIDORS, ROOMS AND ON GYMNASIUM FLOORS

SWEEPS «» DUSTS «» POLISHES . . . IN ONE WIDE, FAST STROKE!

Cleans, dusts, polishes—QUIETLY—and its chemically treated yarn ***holds*** the dust and dirt until shaken out. Heads of long, staple cotton sewn on heavy fabric are removable, interchangeable and easily laundered. Can be re-treated with Nu-Finish after washing. It SPEEDS cleaning!

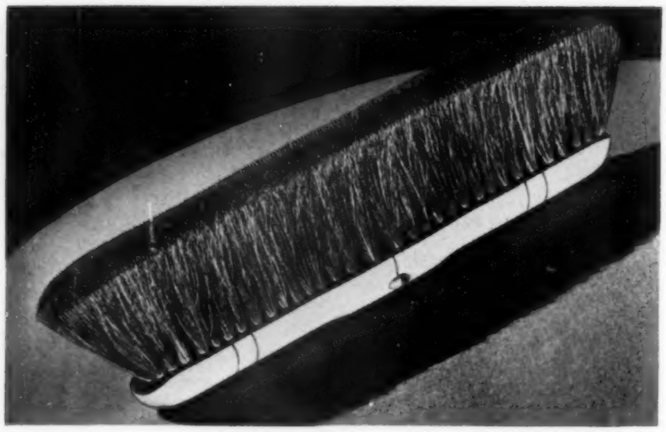
After Laundering — Re-treat with Holcomb Nu-Finish.

Complete Block and Handle with Heads	Heads Only
No. 412 — 12" block	No. 413 — 22" yarn spread
No. 414 — 14" block	No. 415 — 24" yarn spread
No. 418 — 18" block	No. 419 — 28" yarn spread
No. 424 — 24" block	No. 425 — 34" yarn spread
No. 436 — 36" block	No. 437 — 46" yarn spread
No. 442 — 42" block	No. 443 — 52" yarn spread

For "Floor Maintenance Bulletins" see Page 7

Holcomb tools work faster . . . clean more thoroughly the first time over . . . make money by cutting maintenance time. If your Holcomb tool saves only one hour of cleaning time each day, that is a new profit of $240.00 a year . . . on each man (at 80c an hour).

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

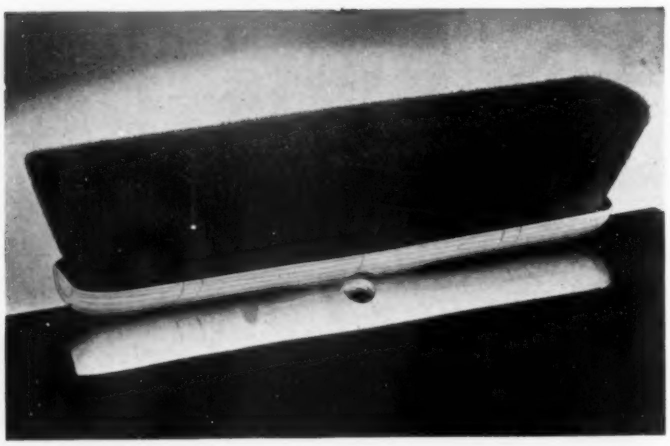


for Sweeping Smooth Floors where Fine and Medium Dirt Prevail

. . . The "UNIVERSAL"

An undisputed leader in all institutions where smooth floors with fine and medium dirt prevail. The combination of springy, dirt digging bristles of Russian and Siberian stock plus the stiff hair mixture insures effortless speed in every "once over" stroke.

Grey stock $3\frac{7}{8}$ in. out of block. Sizes 12-14-16-18-24 inch blocks $2\frac{3}{4}$ in. wide. Handles included.



for Sweeping Smooth and Medium Floors

. . . The "RACER"

Stock center is hair and fiber—outer casing is all snappy, selected hair for keeping fine dirt ahead of the brush. Each hair **sweeps** because full stock keeps it working with the end only. Stock $3\frac{1}{8}$" out of block. 14-16-18-24 inch blocks, handles included. ***Machine Set.***

Designed and built FOR

SCHOOLS AND UNIVERSITIES

. . . The "MEMPHIS"

FAST FLOOR SWEEPER FOR MEDIUM AND HEAVY DIRT

This ideal all around sweeper, the Memphis, makes short work of heavy, stubborn soil. The center stock is of stiff dirt moving fibers surrounded by an aggressive outside casing of bristle. The Memphis will save hours of sweeping time. It moves more dirt in LESS TIME and with LESS EFFORT—it saves dollars as well as manpower. In 12-14-16-18 and 24 inch blocks. Stock $3\frac{3}{8}$ in. out of block.

Handles included.

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* INDIANAPOLIS-NEW YORK

The Holcomb

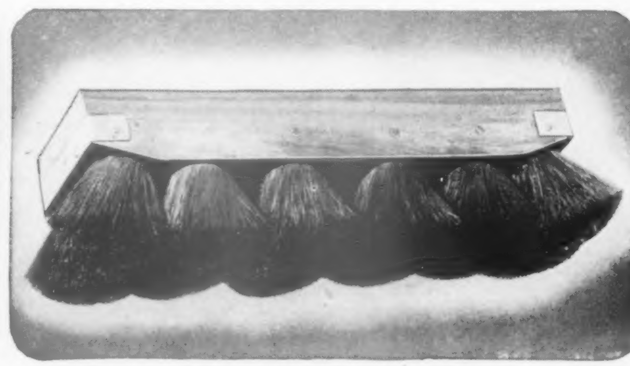
CUSH-END RUBBER CUSHION

WHY IT'S FASTER!

Rubber cushions protect block ends and end-flared bristles as well as furniture, baseboards, desk legs, etc. This permits a FASTER, longer stroke. The operator may sweep fast in schools . . . noiselessly. No time is lost. Tests show it saves one stroke out of five.

12-14-16-18-24 Inch Blocks

It's FASTER . . . It PROTECTS . . . It's NOISELESS



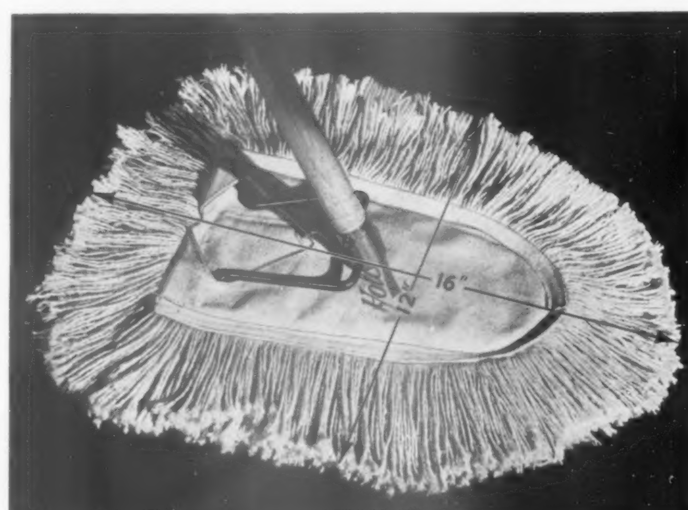
WATER PROOF WAX . . . . . —and— . . . . No. 4066 HANDLE SCRUBBER

for Dusting the Hard-to-get-at Places FAST...

The No. 340 DUSTER

At any angle you hold the Holcomb 340 for dusting woodwork, floors, door casings, walls or ceilings —the face is always *flat* on the surface. Covers and cleans *more* surface, *faster*. Chemically treated soft cotton strands sewn on heavy canvas—slips easily on sturdy frame. Easily laundered and re-treated with Nu-Finish.

No. 340—Mop frame and head complete
No. 341—Mop head only
No. 342—Two 341 heads on double frame complete



The No. 341 Used as a MITTEN DUSTER

. . . makes for fast, efficient dusting . . . the chemically treated yarn picks up and holds more dust. Canvas back protects hands. A "swipe" and it's dusted.

***Re-treat Yarn Dusters and Sweepers with Holcomb* NU-FINISH**

→ See Jumbo Dustless Sweeper on Cover Page ←

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

Holcomb SPECIAL ITEMS

No. 4006 TOILET BRUSH

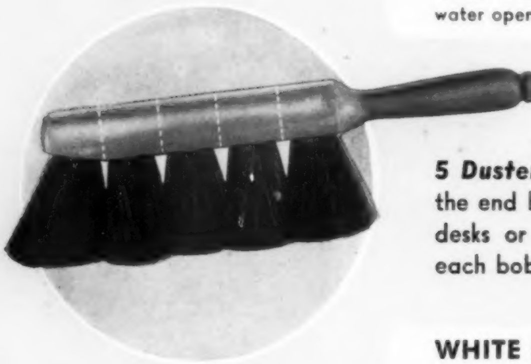
This famous Holcomb tool has the stiff wings that get the scum under the rim. Straight handle for an all around the bowl stroke without changing grip. A clean bowl is odorless.

Use It with "BOWL CLEANER"

Regular use of Holcomb Bowl Cleaner keeps toilets free from discoloration, scum and lime. The No. 4006 and Bowl Cleaner make a perfect Holcomb team.

STOP-GO . . . *Keeps the plumber out of your DRAINS!*

Stop-Go dissolves or loosens foreign matter which clogs drains, grease traps, toilets, wash stands, shower drains, etc. One can dissolved in 2 qts. of boiling water opens a stopped drain in 2 to 10 minutes.



No. 16 BENCH DUSTER

5 Dusters in ONE! Saw yourself a "new" bench duster when the end bob wears down. The No. 16 cleans benches, chalk rails, desks or ANYTHING, ***FAST!*** "Bob" constructed for strength, each bob an individual unit, "flared" and full of snap.

WHITE STREAK *"Quick-as-a-Flash!"* Cleanser

For BATHTUBS, URINALS, WASHBOWLS, SINKS, Etc. Porcelain, tile, enamel or granite. It's FAST. One swipe and the dirt's off. Cleans so well things stay clean longer.

275 lb. Bbls., 80 lb. Kegs, 25 lb. Drums (Cartons 6, 1-lb. Shaker Tins)

FLOOR TREAT *SPRAY IT ON— SWEEP IT OFF!*

MAINTAINS WOOD FLOORS FOR *LESS!*

For treating unsealed wood floors and in maintaining varnished wood; Linoleum, Rubber, Composition, Tile, Terrazzo, etc., and waxed or unwaxed surfaces of wood or steel. Restores natural finish and builds up a glossy surface. Your floors sweep FASTER!

DISHWASHING COMPOUND

For ***machine*** dish washing ONLY! It's FAST... and free rinsing without leaving soapy film. No scale in machine. Economical, one-half oz. per gallon of water. Dishes and glassware remain free of deposits and water marks.

FRESHETTES . . . *Rest Room Deodorant*

They are for ONE purpose only. Holcomb FRESHETTES ***replace*** objectionable odors in lavatories and urinals with a pleasant fragrance. Insoluble in water. 6 to a can. Cartons of 4 and 12 cans.

"INSEKIL" . . . *for* FLIES - BUGS - ROACHES

It's for Flies, Moths, Mosquitoes, Ants, Roaches, Bedbugs, Water Bugs, Spiders, Centipedes. Knocked down 100% of flies in 10 minutes (Peat-Grady Test).

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

THE FULLER BRUSH COMPANY

INDUSTRIAL DIVISION

3566 Main Street, Hartford 2, Connecticut

Fuller

SCHOOL CLEANING EQUIPMENT

FIBER BROOMS

Light weight, medium texture, 10″ trim, 14″ flare. Long wearing fibers, set in metal shell, wear down evenly. Not affected by water.

FLOOR BRUSHES

Blended stiff hair and fiber center, all hair casing. 3¼″ trim. 12″ to 36″ widths. Staple-set—not affected by oil, water or acids. Solid hard wood blocks. Supplied with handles.

WET MOPS

Maximum absorbency, easiest rinsing, longest wearing. Three types of construction — narrow tape, wide tape, solid head, in 12, 16, 20, 24, and 32 ounce weights. Also heavy duty rope type mops for rough floors.

Fiber Brooms
Floor Brushes
Radiator Brushes
Wall Brushes
Window Brushes
Venetian Blind Brushes
Dust Brushes
Handles
Wet Mops
Dry Mops
Launderable Dry Mops
Cotton Dusters
Wax Applicators
All-Purpose Cleaner
Furniture Polish
Metal Polish
Floor Wax
Toilet Bowl Brushes
Urinal Brushes
Bottle Brushes
Test Tube Brushes
Tumbler Brushes
Scrub Brushes
Deck Scrubs
Knob Scrubs

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Branch offices in over 100 principal cities. If not listed in your local telephone directory, write or wire our nearest District Manager.

Fuller BRUSH CO.

PALMER FIXTURE COMPANY

Waukesha, Wisconsin

Cost Controlling Appliances for Schools

Palmer Fixture Company specializes in equipment for three common maintenance problems—efficient eraser cleaning, reducing waste in paper towels and toilet tissue, dispensing soap at lowest cost. Each of the Palmer fixtures is the result of years of study of a specific problem in school economy and the most practical mechanical solution. In addition to the products shown, other models will be available as conditions permit. The Palmer line is accepted in schools and colleges everywhere, because of its background of sustained quality and full value.

Member of National School Service Institute

— Please see your school supply distributor for these fine products —

QUALITY SOAP DISPENSERS

Only the finest materials are used in Palmer dispensers, together with thoroughly tested and reliable types of dispensing mechanism. They guard against soap waste, and stand up under hard service with a minimum of attention. All are designed for smart appearance, secure mounting and easy cleaning.

THE PALMER D-C liquid soap dispenser

The proven, low cost "push-up" dispenser, used everywhere. Fine appearing, with chrome plated metal body and clear glass bowl. Palmer's neoprene contact valve, spring controlled, is recognized as the most mechanically perfect of its kind.

THE SUPER SERVER liquid soap dispenser

Outstanding value in a beautiful fixture of "push-in" type. The new Palmer valve is extremely effective and durable. All working parts solid brass (chromed) and stainless steel. Chrome plated metal body, clear glass bowl, cemented.

THE PALMER SOAP-LINE VALVE

A compact, attractive unit, based on the new Palmer precision mechanism (as used in the Super Server). It will give years of trouble-free service under the most severe usage. Solid brass body, chrome plated.

THE PRESPOWDER powdered soap dispenser

A popular dispenser, greatly improved. The rugged mechanism, of finest materials, assures measured delivery of soap under all conditions. Chrome plated metal body, clear glass bowl, cemented.

THE PALMER PC-1 liquid soap dispenser

An excellent low-priced dispenser, using the same soap-proof and leak-proof valve as the D-C. The body is molded of solid porcelain, permanently beautiful. Clear glass bowl.

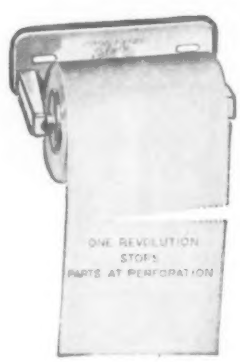
THE PALMER MODEL "C"
ELECTRIC ERASER CLEANER

The best teachers are handicapped unless their blackboard illustrations are clear and legible against a clean background. The efficient Palmer cleaner provides a ready supply of fresh erasers, at minimum cost in labor, to help keep blackboards BLACK.

As used erasers are passed over the cleaning plate they are thoroughly and quickly cleaned. An agitating brush loosens chalk dust (with minimum wear on the felt) and the dust is drawn off by powerful suction. The cleaner mounts firmly to bench and requires very little care.

The PALMER (Model "C") is built to high precision standards. Main housing and cleaning plate are cast aluminum; horizontal brush shaft runs in oilless bearings. Cleaning plate adjustable to compensate for brush wear. Motor of first quality, 110 volt AC or DC, with switch and cord.

CONTROLLED-DELIVERY PAPER FIXTURES



THE ECONOMY
roll toilet paper fixture

Palmer's most successful paper saver for many years, because of outstanding appearance and proven mechanical features — at moderate cost. It's operation is convenient and positive, limiting delivery to one revolution with torsion spring return. Spindle is permanently hinged to arm, spring-locked to prevent removal of roll. Back and arms are heavy guage pressed steel, in a rigid assembly, finished in a rich satin chrome. The Economy is preferred equipment for all school and institutional installations.

THE PALMER NO-WASTE
roll toilet paper fixture

THE PALMER OVAL
notched-oval fixture

The No-Waste and the Oval are in use all over the world, because of the very real savings they make possible. They are similar in construction and operation. The spindle locks when paper is installed; revolves to a positive stop at each delivery, and returns to position by gravity. Simply designed, and built of gray iron, they are inexpensive and almost indestructible. Finished in olive wrinkle enamel.

THE ECONOMY TOWEL roll towel fixture

The Economy Towel fixture gives vital control of paper towel waste. The towel roll is locked in place until used up. Spindle revolves smoothly to a positive stop, permitting only single-sheet delivery, and returns by torsion-spring action. A permanent fixture, cast in gray iron, finished in olive wrinkle enamel.

WEST DISINFECTING COMPANY

42–16 West Street, Long Island City 1, New York

SANITATION IN SCHOOLS

To service the School Systems throughout the United States and Canada, West maintains branch sales offices in 60 major cities from Coast to Coast. Close to 500 West Representatives, specially trained in the sanitation needs and problems of Schools, are ready to serve you.

SANITARY BUILDING MAINTENANCE

TERAMINE

Quaternary Odorless Disinfectant and Approved Sanitizer. F.D.A. Phenol Coefficients: 20 against EB. Typhosa, 28 against Staphylococcus Aureus (pus germs), and 7 against Escherichia Coli. Teramine's high bactericidal efficiency makes it unsurpassed for economy and efficiency. The mere change in dilution makes Teramine a Sanitizer or Disinfectant.

CORO-NOLEUM

Coal-Tar Disinfectant-Cleanser-Deodorant. Ideal for mopping, scrubbing and general cleaning, thus eliminating the need for soap. Coro-Noleum kills the germs of many communicable diseases.

WESTONE

To free atmosphere from dust caused by traffic, use Westone, a liquid chemical treatment that improves floor appearance as it controls dust. Westone has an affinity for dust, penetrating rapidly and evenly, offering maximum dust control with a minimum cost.

KWYKWAX

A water soluble wax for all types of floors, Kwykwax dries in less than 20 minutes producing a high, glossy finish. Kwykwax is a long-lasting floor preservative and finish that requires no rubbing or polishing.

LASTINCOTE

Available in clear or 11 attractive colors, Lastincote is a remarkable hard wear-resisting floor finish. Ideal for actively used floors such as gymnasiums. By penetrating the surface, Lastincote seals floors against dirt, oil, grease and moisture. Retards the harmful action of body perspiration, rubber burns, water, etc. Economical and easy to use.

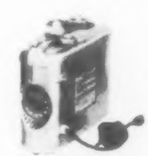
ZOLEO

Zoleo is an ideal liquid cleaning soap for all types of floors except rubber. In solution, Zoleo softens the dirt and loosens the grease without hard scrubbing.

INSECT AND PEST CONTROL

VAPOSECTOR FLUID

One of West's vast array of general and special purpose insecticides. Vaposector Fluid is a highly concentrated, permeating insecticide available in Regular, Odorless and Non-Inflammable forms. Non-toxic as well as non-staining, West Vaposector is unsurpassed in killing efficiency.



WEST VAPOMAT

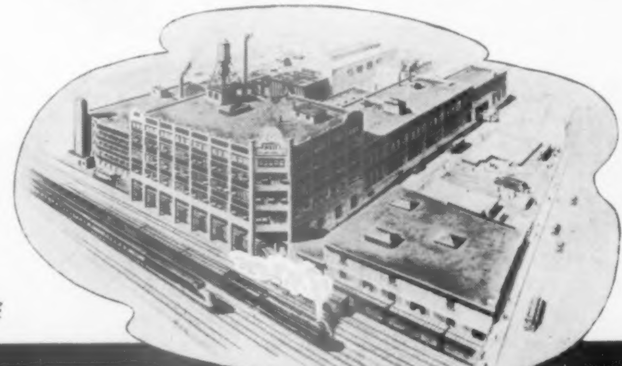
Completely automatic insecticide dispenser. Just fill, plug into AC or DC outlet. Time clock governs length of time of operation desired. Automatic shut-off prevents burn-outs and dial control regulates volume of dispersal. Simple and safe to operate, the Vapomat's fogging action is deadly to crawling and flying insects in all areas up to 500,000 cubic feet.

WEST MISTORIZER

For manual, hand directed action this automatic insecticide sprayer is ideal. Easy and safe to use, the West Mistorizer has an adustable nozzle volume control and requires no water. Light and portable, it saves time and labor while providing efficient insect control at low cost.

RODITE and MURDIRAT

Especially prepared cereal crackers containing an attractive flavor and scent to lure rodents into eating crackers. Alternating Rodite (containing Red Squill) with Murdirat (containing Antu) prevents rodents from recognizing the bait.



WRITE FOR FREE BOOKLETS AND LITERATURE

WEST DISINFECTING *Company* 42-16 WEST STREET LONG ISLAND CITY 1, N. Y.

THE EMPIRE VARNISH COMPANY

WATERLOX DIVISION

2638 East 76th Street, Cleveland 4, Ohio

WATERLOX TRANSPARENT
Triple A Floor Sealer and Finish

A Waterloxed Gym Floor at Van Wert, Ohio

Waterlox Transparent, a tung-oil product, is a thin transparent liquid which is used directly from the can. It has innumerable uses, as it penetrates beneath the surface and clings to the inner pores of the material on which it is applied.

First, Waterlox is the finest of floor sealers for schools and institutions. It produces a gloss comparable to wax but wears indefinitely and *does not leave a slippery surface.* Waterlox economy lies in its exceptional coverage and long life. It meets specifications of the Maple Flooring Manufacturers Association. Waterlox is the ideal finish for all floors. Gym floors, particularly, remain new longer and are more easily cleaned when finished with Waterlox. Sanitation in toilets is greatly improved, too!

Used as a varnish, it is an excellent protector of window sills and woodwork, especially where moisture is encountered. Waterlox is a perfect preservative for stadia, benches, bleachers and athletic fixtures. Also, Waterlox can be used as a vehicle with good paint or enamel to prolong its durability. It adds to both life and beauty of the coating.

WATERLOX FINISH COAT

Waterlox Transparent Finish Coat is used as a varnish. It contains no wax or paraffin and is a transparent finish which expands as it dries. It may be rubbed to a high piano finish.

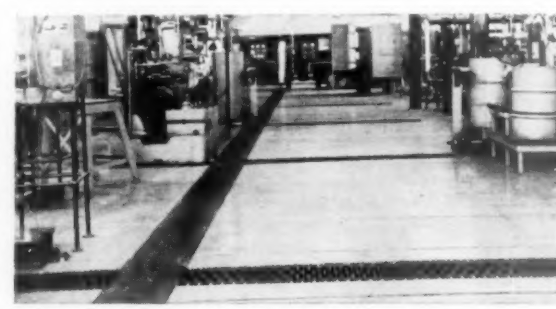
Waterlox Finish Coat seals the surface thoroughly with a fine durable glossy finish that intensifies the color over which it is applied. It resists moisture, acids and fumes, alkalies, and extreme heat and cold. It is an excellent finish for furniture, desks, table tops of metal or wood, and puts a high gloss final coat on hardwood floors. Waterlox Finish Coat is equally effective on new or previously varnished surfaces.

The can label has directions but it is **not to be used over, under, or in lacquer.**

WATERLOX HADES ALUMINUM

Waterlox Hades Aluminum Paint is expressly formulated for the protection of metal surfaces subject to maintenance difficulties from extreme heat. Its performance has been outstanding wherever it has been used, not only under ordinary heat, but in the face of exceptional obstacles. Iron plates, painted with this product may be heated to a bright red color (1350 degrees) and when the metal cools the original bright, silvery color remains unchanged. It will not flake or peel.

Waterlox Hades Aluminum Paint has exceptional covering qualities and can be applied to either hot or cold surfaces, by brush or spray. *Dipping is not recommended.* Surfaces should be free from grease, oil, loose rust or burned coating. The cleaner the surface, the better the results. Like all aluminum paints, Waterlox Hades Aluminum must be agitated frequently while in use. Brush strokes should be all in one direction.



Boiler and Engine Room of the Case School of Science

WATERLOX CEMENT FLOOR STAIN

Appearance, durability and economy are combined in Waterlox Cement Floor Stain to give you the most for your money. It is a finished blend of Waterlox Transparent and a skillfully developed pigment. It is not a dye and not a paint, but it has all the hiding qualities of the best cement floor paints, and an endurance beyond that of other coatings. It virtually locks itself into the porous surface of concrete, metal, or wood, resulting in a smooth, even surface of lasting color.

Waterlox Cement Floor Stain comes in bright, gay colors that make a cement-floored room sparkling and livable. It is an excellent coating for wax-free linoleum, and rejuvenates worn wood surfaces most successfully. It is also a beautiful trim for metal and tile roofs and spouting.

— DESCRIPTIVE FOLDERS —

"FLOOR MAINTENANCE"
"CEMENT FLOOR STAIN"
"USES AND FACTS"
"WATERPROOFING TIPS"

U. S. SANITARY SPECIALTIES CORPORATION

407 S. Western Avenue, Chicago 12, Ill.

57 East Twelfth Street, New York 3, N. Y.

Soaps—Dispensers—Disinfectants

Floor Treatments—Deodorizers

Soaperior MAINTENANCE PRODUCTS

CLEANERS

TILEZE XX—Floor Cleaner. A specially compounded cleaner and solvent recommended for *all types* of floors. Cleans quickly, but absolutely harmless. Can be sprayed or mopped on. We furnish sprayers. Heavily concentrated, very economical.

FORMULA NO. 7—Bowl Cleaner. Powerful solvent for removing encrustations and for cleaning toilet bowls and urinals. Non-injurious to plumbing.

WAX

LUSTER-BRYTE—A long wearing non-slip wax with exceptional water resistance. Dries bright without polishing. Beautifies the floor, simplifies maintenance, and gives maximum protection. Also other grades.

SEALERS

PRESERVA-SEAL—Penetrating floor sealer. For wood, cork and concrete floors. Penetrates deeply. Prevents excessive wear, splintering, warping and dusting. Approved by Maple and Oak Flooring Manufacturers Associations.

TUFEN-BRYTE—For gymnasium floors and school room furniture. Seals and finishes, and resists rubber burns. Approved by Maple and Oak Flooring Manufacturers Associations.

DEODORIZERS

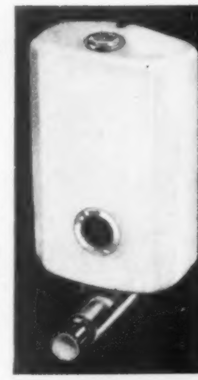
AERZONATOR BLOCS—Purify the air in toilet rooms and leave a pleasant fragrance. Only one AERZONATOR required for two or three toilet fixtures.

SANI-DOMES and BLOCS—Porcelain fixture. Replaces drain plate and holds SANI-DOME deodorant bloc at the source of odors. Provides ample drainage. Easily cleaned.

DISINFECTANT

CLENOPINE (Steam-distilled Pine Oil)—Disinfects, cleans, deodorizes and kills germs in one operation. No soaps or other cleaners needed. Non-toxic, non-corrosive and non-injurious to hands or floors. For wash rooms and general disinfecting.

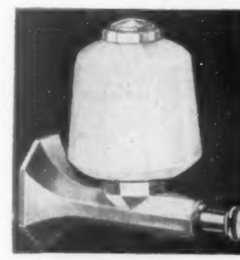
Soaperior SOAP DISPENSERS



No. 149—Lather
No. 159—Liquid

Steel tank, porcelain enameled inside and outside. Thoroughly corrosion-proof, as there is no exposed metal in contact with soap. Occasional wiping with a damp cloth keeps this dispenser looking like new. Sight-glass shows soap level, filler cap locks on, and the wall fasteners are concealed. 1 quart.

Precison leak-proof valves, adjustable packing around stem. No. 149 discharges lather; No. 159, liquid soap.



No. 141—Lather
No. 151—Liquid

Streamlined one - piece bracket with concealed wall fasteners. Available with opal or clear glass globe, or chrome plated metal globe. Adjustable stem packing, locking filler cap. No. 141 for lather; No. 151 for liquid soap.

No. 800

Our lowest-priced push-up dispenser. Made from glossy black plastic, clear globe. As an added feature, spring is removable for replacement.

Also recommended for hand lotions, synthetic hand cleaners, and germicidal detergents.

No. 100

No. 100—Round Tank with glass fluid gauge, rust-resisting metal, white enamel finish. 1, 2 and 5 gallon.

No. 204

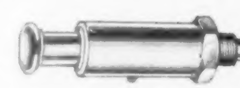
No. 204 — Rectangular Tank with float gauge and arrow indicator. Self closing filler cap. White enamel finish. 1 and 2½ gallon.

Soaperior LIQUID SOAP SYSTEMS

Recommended for basins installed in batteries and for shower rooms. Chrome or galvanized exposed installations—or pipe can be concealed in or behind wall. We cut the pipe and furnish fittings. Send layout for price estimate.

No. 103 Liquid Soap Valve

The only valve on the market with an integral rear shut-off. Mechanism removable for cleaning or repair without shutting off soap at the tank—other valves on same line remain in use. Non-leak construction. Adjustable stem packing.



No. 140 Lather Valve

Precision fitted mechanism. Dispenses firm lather. Leak-proof and economical. Adjustable stem packing.

Soaperior LIQUID SOAP

Made from pure cocoanut and other vegetable oils. Guaranteed neutral, does not crack, chap, or dry the skin. Abundant lather cleans quickly, rinses thoroughly.

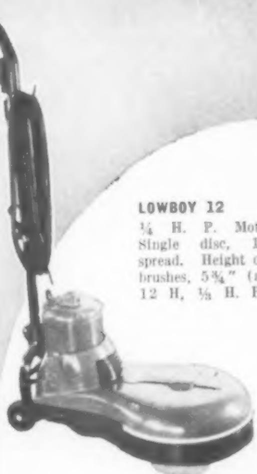
ADVANCE FLOOR MACHINE COMPANY

2605 Fourth Street S. E., Minneapolis 14, Minnesota

IMPROVE YOUR FLOORS and REDUCE MAINTENANCE COSTS

with the

Lowboy 12

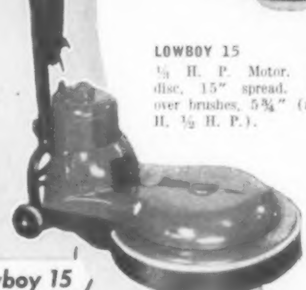


LOWBOY 12
¼ H. P. Motor. Single disc, 12" spread. Height over brushes, 5¾" (also 12 H, ⅓ H. P.).

Lowboy 16

LOWBOY 16
⅓ H P. Motor. Twin disc, 16" spread. Height over brushes, 6¼". 2½ gal. dispensing tank available as extra on any model.

Electric FLOOR MACHINE



LOWBOY 15
⅓ H. P. Motor. Single disc, 15" spread. Height over brushes, 5¾" (also 15 H, ½ H. P.).

Lowboy 15

Really clean floors look better, are safer and wear longer. With an Advance "Lowboy," all scrubbing, waxing, polishing, or steel wooling can be done faster and better at less cost for labor and materials. Works on every kind of floor—wood, linoleum, asphalt tile, composition, terrazzo, cement, marble, tile, etc. Adjustable splash guard protects walls, baseboard, desk legs, files, etc. NEW ADJUSTABLE HANDLE is instantly changed to any operating position by foot control.

LOWBOY 21
½ H. P. Motor. Twin disc, 21" spread. Height over brushes, 6¾". The ideal machine for large areas.

Lowboy 21

Single disc construction. "Lowboy" 12, 3-segment brush. "Lowboy" 15, 4-segment brush.

CONSTRUCTION DETAILS

Motors are specially wound for extra power and protected against moisture. Selected close tolerance Timken roller bearings are used for quiet operation. Handle is tubular steel welded construction with built-in switch. Brushes are segment type attached to patented quick change brush holders. Working parts are totally enclosed and protected, in self contained units packed with lubricant and sealed against entrance of water, dirt, etc.

STANDARD EQUIPMENT—110 v. 60 cycle A. C. motor. Two sets fibre brushes for scrubbing and polishing complete with holders. 50 feet Underwriters' approved rubber covered cable. All machines piped to receive dispensing tank.

EXTRA EQUIPMENT—2½ gallon dispensing tank with finger-tip feed control. Special steel wool holders to receive our standard steel wool pads. Steel wire brushes for heavy scrubbing. ("Lowboy" 16 and 21 only—burnishing attachment for holding lambswool buffing pads.)

Twin disc construction. "Lowboy" 16 and 21. Two 3-segment brushes. Opposite rotation, no side pull.

REMOVING RUBBER BURNS FROM GYM FLOOR—With steel wool pads and cleaning solution, the ADVANCE "Lowboy" 21 removes rubber burns. Will also buff down floor seal.

POLISHING ASPHALT TILE FLOOR—For average sized rooms, the ADVANCE "Lowboy" 15 is very easy to maneuver, yet is speedy and quiet in operation.

"LOWBOY" 12 FOR CLASSROOMS—The "Lowboy" 12 reaches every nook and corner under classroom desks—and if ever there's a place where floors need care—this is it.

THE AMERICAN FLOOR SURFACING MACHINE CO.

516 South St. Clair Street
Toledo 3, Ohio

AVAILABLE IN 3 DISC MODELS

17-INCH De Luxe
Construction: Cast Aluminum Alloy, highly buffed and polished. *Brush Dia.:* 17 in. *Motor:* ¾ H.P. A.C., 110-220 volt, 60 cycle. *Weight:* 116 lbs.

15-INCH De Luxe
Construction: Cast Aluminum Alloy, highly buffed and polished. *Brush Dia.:* 15 in. *Motor:* ½ H.P. A.C., 110-220 volt, 60 cycle. *Weight:* 87 lbs.

13-INCH De Luxe
Construction: Cast Aluminum Alloy, highly buffed and polished. *Brush Dia.:* 13 in. *Motor:* ⅓ H.P. A.C., 110 volt (single voltage only). 220 volt motor also available. *Weight:* 54 lbs.

Ideal for all-around floor maintenance, the AMERICAN Deluxe is adaptable to polishing, scrubbing, scouring, steel-wooling or disc sanding by merely changing the brush or disc as required. Can be operated either as a riding-on-head or a riding-on-wheel unit.

AMERICAN STANDARD FLOOR SANDERS

(Not illustrated). Made in two sizes: 8″ *width Sanding Drum,* with heavy duty 1½ H.P. Motor, 1600 R.P.M. 12″ *width Sanding Drum* with 2 H.P. Motor, 2000 R.P.M. Constructed of special cast aluminum alloy. Details on request.

AMERICAN "LOW BOY" FLOOR MACHINE

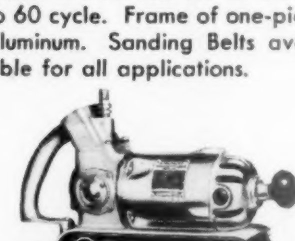
A silent running machine constructed *low enough* for use under desks, beds and other furniture for elimination of all extra hand work. *Construction Features* include Rubber Handle Grips, Adjustable Steering Handle, Brush Leveling Device, Extra Wide Rubber Bumper, 16 in. Sectional Brush, Electric Toggle Switch on Handle, Full Ball Bearing Electric Motor in ¾ H.P. Capacitor, 1 H.P. and 1½ H.P. Repulsion-Induction, Main Frame of cast aluminum.

AMERICAN SPEEDY SPINNER

An all around portable sander complete in itself. For smoothing surfaces on wood, metal, plastic, glass, marble, etc... with ten times the speed of hand work. Has 5½″ sanding disc with speed of 1200 R.P.M. Cast Aluminum alloy construction. 9¼″ long, 4″ wide, 6″ high. Weighs 5 lbs. 10 oz. Heavy duty, air cooled motor. 20 ft. cable. All necessary operating discs and equipment furnished.

AMERICAN SANDERPLANE

An electrically-driven Belt Sander for all wood, metal, stone and marble sanding. Does work of four hand planes. Made in Two Models: *Model No.* 3 complete with built-in dust collecting system. *Model No.* 2, same as No. 3 except without dust collecting system. Abrasive Belt is 3″ x 25″ long with approx. speed of 820 ft. per min. at maximum. Motor is 110 volt AC or DC up to 60 cycle. Frame of one-piece aluminum. Sanding Belts available for all applications.



CLARKE SANDING MACHINE COMPANY

47 Clay Avenue Muskegon, Michigan

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

CLARKE P-17 FLOOR MAINTENANCE MACHINE

Scrubs · Waxes · Sands · Polishes · Steel Wools · Shampoos

Speed, power and dependability—a ¾ hp motor—a full 17 inch brush—all at the lowest price on the market for this size and type machine.

Use the P-17 for all your school floor cleaning and treatment requirements. It has 50% more power, 20% greater brush area, 30% greater speed and more all-around utility. It is easily maneuverable in "tight quarters" and gives a smooth, noiseless performance. It is built close to the floor so that it operates easily under desks, chairs and other low-set furniture.

Write for catalog sheet.

CLARKE P-12 POLISHER

Polishes · Scrubs · Waxes · Steel Wools

The lightweight, streamlined P-12 is an excellent machine for operation on relatively small areas. It is easily handled and is fast in operation. Because of sturdy, simplified construction maintenance costs are held to a very minimum.

Write for catalog sheet.

CLARKE DUO (F-5) PORTABLE ELECTRIC SANDER-POLISHER

Accessories Quickly Change it to a Drill, Grinder, Buffer, Brush or Steel Wooler — *Ask for Catalog Sheet Listing all Accessories*

Most versatile tool you ever saw—for all types of refinishing and repair. Lightweight, powerful, rugged. Listed by Underwriters' Laboratories Inc. Easy to operate. Excellent for refinishing and polishing desks, refinishing blackboards, polishing lockers, sanding playground equipment. Also used for training in the school shop.

Write for catalog sheet.

CLARKE MV-8 AND LV-8 FLOOR SANDERS

These ruggedly built drum type floor sanders meet all school maintenance requirements for speed and performance. Efficient vacuum system makes operation dustless. Lifetime lubricated sealed ball bearings require no attention. Perfect balance makes control easy.

Write for catalog sheet.

CLARKE V-5 EDGER

The most powerful edger ever developed. Quickly and easily sands floor edges and all other types of small areas. Compact, lightweight, sturdy construction. Weighs only 20 pounds—easy to guide and handle.

Write for catalog sheet.

P-17

Brush diameter .... 17"
Brush speed .... 169 rpm
Motor .... ¾ hp
Weight .... 115 pounds

P-12

Brush Diameter .... 12"
Brush Speed .... 185 rpm
Motor .... ½ hp
Weight .... 30 pounds

DUO

Model F-5

Motor . . . 115 volt, AC-DC with trigger switch
Disc .... 5"
Disc speed . . . 5000 RPM without load, 3000 RPM with normal load
Weight .... 4 pounds

MV-8

Motor . . . 1½ hp heavy duty universal
Drum Diameter .... 5½"
Drum Width ...... 8"
Net Weight ...... 92 pounds

LV-8

Motor . . . ½ hp continuous duty—115 volt AC 60 cycle
Drum Diameter .... 4¾"
Drum Width ...... 8"
Net Weight ...... 94 pounds

V-5 EDGER

Motor . . . ¾ hp continuous heavy duty universal
Disc Diameter ...... 5"
Speed of Disc ...... 3100 rpm
Net Weight ...... 20 pounds

MANUFACTURED BY CLARKE . . . BUILDERS OF HIGH QUALITY SANDING AND FLOOR MACHINES FOR MORE THAN A QUARTER OF A CENTURY

GENERAL FLOORCRAFT, Inc.

(Department "A") — 333 Avenue of the Americas, New York 14, N. Y.

PROTECT YOUR FLOORS with a LABOR SAVING *General*

These Wonder Working Machines Will Do Everything, Everywhere For All Types of Floors, Faster at Lower Costs.

Precision-Built *Generals* will save and protect your new floors, rejuvenate your old floors, enhance the appearance of your building interiors. They eliminate the necessity for all old fashioned hand labor by performing any of your floor maintenance operations better and at a fraction of your present costs.

GENERALS are built rugged for heavy duty day-in, day-out operation and at negligible operating costs. They are engineered and built by a company whose reputation for precision is inter-nationally known. The name *GENERAL* is your assurance of quality and honest engineering.

GENERAL Floor Machines are used by schools, colleges, hospitals, institutions, leading industries, offices, public buildings, hotels and recreation centers, all over the world.

GENERAL Floor Machines are available in two series. The "K" models are powered by heavy duty repulsion-induction type motors . . . Designed for the long hour duty heavy type of floor maintenance. They are especially recommended for factory and institution use, or in large installations where traffic is heavy and floor maintenance is a major problem. They are unusually quiet under operation . . . Available in 14", 16" and 18" brush sizes.

The "KM" LO-HITE models are available in two sizes, 14" and 16" . . . Powered by especially built heavy duty capacitor type motors of low design. They are built lower than most machines . . . Get under desks, machinery, counters, and other confined areas, previously only accessible to tedious hand operations. Super-quiet, it is built for schools, hospitals, hotels, etc.

MODEL "K"

MODEL "KM" LO-HITE

GENERAL FLOOR MACHINES WILL

- *SAVE LABOR COSTS*
- *RESTORE ALL TYPES OF FLOORS TO THEIR ORIGINAL NEWNESS*
- *ENHANCE THE APPEARANCE OF ALL INTERIORS*
- *ELIMINATE UNSANITARY CONDITIONS*
- *ARE LOW IN OPERATION COSTS*
- *ARE LOW IN MAINTENANCE COSTS*
- *ARE LOW IN ORIGINAL COST FOR VALUE RECEIVED*

GENERAL GFC FLOOR CRAFT INC.

Write for literature, prices and other information desired. Name of *GENERAL* authorized dealer nearest your locality will be given and free demonstration on your own floors may be arranged.

GENERALS ARE SOLD ONLY THROUGH AUTHORIZED DEALERS

HILD FLOOR MACHINE CO.

ESTABLISHED 1927

1313 W. Randolph St., Chicago 7, Ill.

Manufacturers of Electric Floor Machines and Portable "All-purpose" Vacuum Machines used for every Floor Maintenance Job on All Kinds of Floors

TWO STYLES

Pictured here are the Plain Handle Machine and the Portable Tank Type Machine. Either style of machine is used to scrub, wax, polish, buff, sand, grind, or steel-wool floors.

The Tank-type Machine is designed for use with the patented Shower-feed Brush to scrub floors by the HILD "Shower-feed System" . . . and also to shampoo rugs and carpets without removing them from the floor.

HILD FLOOR MACHINES

HILD Floor Machines, with a series of easily interchangeable attachments, perform every type of maintenance job on all kinds of floors . . . as pictured below. They may be used . . . with minimum labor and material costs . . . to keep floors healthfully sanitary and attractively clean and bright.

The HILD Floor Machine is 100% efficient because the entire weight is on the brush. However, being self-propelling, this machine operates so easily that it can be run for long periods without tiring the operator. It goes right up to the baseboard and under desks, and may be easily guided in and out of corners and around columns.

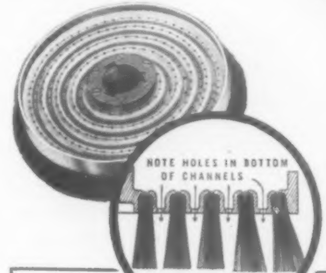
Only highest quality materials and workmanship are employed. All HILD Machines for use on single phase alternating current are equipped with capacitor-start motors, built to withstand tremendous overloads. Model "C" and "D" Machines employ a vertical gear motor with multiple transfer gears to transmit power from motor to brush. Divided load reduces individual tooth stress, vibration, gear noise and power loss. These motors are fully mounted in rubber to absorb vibration. The machine is practically noiseless in operation. Model "A" and "Junior" Machines employ a capacitor-start horizontal gear box motor. All models are equipped with rubber bumpers and the HILD Safety Switch which automatically shuts off power when operator's hands are removed from the handle.

SPECIFICATIONS: *Four Popular Single Brush Models*

Plain-handle Floor Machine		***Junior***	**Model "A"**	**Model "C"**	**Model "D"**
Motor:	(Time Rating—Continuous)				
	Horse Power	¼	1/3	½	¾
	Temperature Rise	40°	40°	40°	40°
	R.P.M.	1725	1725	1725	1725
Cable:	Length	40 ft.	40 ft.	40 ft.	50 ft.
	Gauge of wire	16	16	14	12
	Conductors	2	2	2	3
Brush:	Diameter of spread	11 in.	14 in.	16 in.	19 in.
	Diameter of Brush Block	9½ in.	12¼ in.	14 in.	17¼ in.
	Speed (R.P.M.)	180	180	172	172
Weight:	Complete with wood back fibre-filled brush	57 lbs.	64 lbs.	100 lbs.	132 lbs.

Additional Specifications for "Shower-feed" Machines —

Tank Capacity		3 gal.	3 gal.	3 gal.	3 gal.
Weight:	Complete with fibre-filled shower-feed brush	71 lbs.	78 lbs.	110 lbs.	142 lbs.



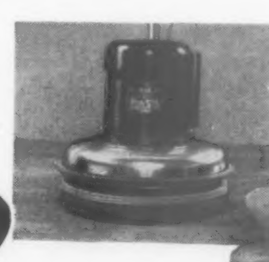
Patented HILD Shower-feed Brush

Scrubbing with this Brush on a HILD Tank-type Machine gets floors cleaner . . . faster . . . with substantially lower soap and labor costs. Scrub soap solution is fed from the tank through numerous holes penetrating the brush back *between each row of bristles*. This even, economical distribution cleans more thoroughly without waste. The brush is refillable.

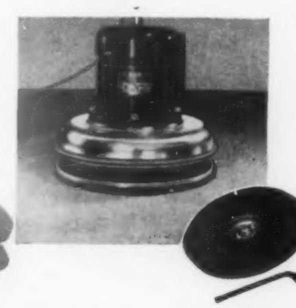
FLOORS OF ALL KINDS **waxed · polished · buffed · ground · steel-wooled · sanded**

WAXING AND POLISHING floors to a hard, lustrous finish with polishing brush on HILD Floor Machine.

BUFFING with lambs' wool or felt buffer on HILD Floor Machine. Removes streaks, goes under radiators, polishes waxed cove baseboards.



STEEL-WOOLING with pad and holder on HILD Floor Machine. Used for dry cleaning, polishing, scrubbing, wet buffing of penetrating seals, etc.



SANDING disc on HILD Floor Machine sands wood or cork tile. A 3-inch flat counter-sunk plate holds sandpaper firmly to rubber padded metal disc.

HILLYARD SALES COMPANIES

Hillyard Chemical Co., St. Joseph, Mo.

470 Alabama St.
SAN FRANCISCO 10, CALIF.

DISTRIBUTORS

BRANCHES IN PRINCIPAL CITIES

1947 Broadway
NEW YORK 23, N. Y.

HILLYARD . . . *Tested and Approved*
Materials and Equipment for Every School Need!

H-101

CLEANER AND DISINFECTANT COMBINED

H-101 is highly efficient in destroying certain types of organisms. Emulsifies greases and oils, wets and supends dirt in solution for instant removal, cleans and disinfects glass, cement, marble, wood, paint, linoleum, rubber, asphalt.

AUTOMATIC BRUSHES

This popular combination brush and sweeping mop not only saves labor and materials but insures uniform sweeping of floors. They absorb the dust instead of kicking the dust in the air as brooms or brushes do. They leave a clean, lustrous floor for they actually polish as they sweep. The mops or wicks or heads are chemically treated, manufactured and patented by Hillyards in four sizes, 12-inch, 18-inch, 24-inch and 36-inch.

HILCO MACHINE

Powerful 16" quiet Scrubbing, Polishing, Steel wooling and Sanding single brush Machine with several newly patented features. Available with or without water or shampoo tank. Immediate delivery.

STEELTONIAN

HILLYARD'S STEELTONIAN. A specially designed machine in two sizes, 10-inch and 20-inch, for dry cleaning and polishing floors with steel-wool. A burnisher for Penetrating Seals into wood floors. The Steeltonian is an exclusive Hillyard patent that effectively cleans (wet or dry), polishes, seals and burnishes floors. 10-inch now available.

HILTONIAN

HILTONIAN LOW-BOY SCRUBBING AND WAXING MACHINES are sturdy, modern combination scrubbing and polishing machines that coordinate speed, power and weight. The twin interlocking, interchangeable brushes eliminate streaking. 3 sizes, 16, 19, 22 inches.

THERE IS A HILLYARD FLOOR TREATMENT MANTAINEER IN YOUR LOCALITY, HIS ADVICE IS FREE, CALL OR WIRE US. NO OBLIGATION.

PORCELAIN CLEANER

A quick acting dissolving powder for cleaning enamel, porcelain or vitreous surfaces. Splendid for cleaning utensils, aluminum wear, etc. Will not harm porcelain or vitreous surfaces.

WINDO-CLEAN

WINDO-CLEAN. A lightning liquid spray cleanser that dissolves dirt, grime and discoloration on all types of glass. It eliminates buckets, sponges, water, squeegees and chamois.

PICK-UP PAN and SQUEEGEE

A popular combination of Pick-Up Pan and Squeegee insures cleaner floor surfaces. Dirt and water both are picked up without a streak left behind.

CURVE ACTION SQUEEGEE

Forms a suction, pulling dirt and foreign substance from the pores of the floor. Curvature holds the cleaning solution, carrying it where the operator wants it. It eliminates washing and wringing of mops.

RUG SHAMPOO

A tested and approved economical Shampoo for carpets, rugs, upholstery, stage curtains, that has been successfully used by hundreds of public and private institutions.

SURGA-HAN SOAP

SURGA-HAN LIQUID SOAP has performed the all-important job of surgical wash-up with dependable efficiency. Its rich, lubricating, creamy lather cleanses quickly and carefully, leaving the skin soft and clean with no irritation or burning.

VICTOR DISPENSER

One frame adaptable for three positions — HORIZONTAL, VERTICAL, SUSPENDED. Substantial, Dependable, Perfect in Operation, Attractive in Appearance, Clear Flint Glass Container. Genuine brass parts heavily nickeled. No spring to get out of adjustment. No drippage. Made in three separate parts.

VELVA-BABE Dispenser

A handy nursery dispenser that can be moved to any convenient place when in use. Operated with the back of the hand, it is sanitary and also leaves other hand free to protect baby. Heavy metal rubber padded base will not allow it to jiggle, tip, slip or scratch and is so built that drippage is eliminated. Durable and attractive chromium plated finish.

THERE IS A HILLYARD APPROVED PRODUCT FOR EVERY HOUSEKEEPING REQUIREMENT, TO HELP SYSTEMIZE . . . ECONOMIZE

LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

1258 West Van Buren Street, Chicago 7, Ill.

OVER HALF A CENTURY

Lincoln Products Have Faithfully Served Schools and Universities

The Lincoln Line of Floor Scrubbing and Polishing Machines Includes:

No. SD-115. The Lincoln Single-Disc "Sphinx" Silent Polisher and Scrubber. Full weight of the motor directly over brush. Perfectly balanced for easy operation. Equipped with safety switch. Brush covers in excess of 15 inches floor span and works right up to baseboard.

No. SD-118. This heavy duty single-disc "Sphinx" Silent Polisher and Scrubber has a floor span of 18 inches and is ideal for large areas. Has an automatic safety switch, extra length guide handle and life-time lubrication. May be equipped with tank and automatic water feed if desired.

No. 132. Especially designed for efficient, fast and economical scrubbing and polishing in medium-size schools and institutions. Interchangeable scrubbing and polishing brushes are available for all Lincoln polishing machines. The floor span of this machine is 16 inches.

No. N-21. Heavy Duty Twin-Disc Model . . . the world's fastest and most efficient polishing and scrubbing machine. Has 21 inch brush span. The twin brushes revolve in opposite directions eliminating all side pull or whip—thus, even with its size, this machine is guided without effort.

The Lincoln Single-Disc SD-115 Scrubber and Polisher

The Lincoln Twin Disc No. 132 Scrubber and Polisher

THE LINCOLN R. S. 15 RUG SCRUBBER

Cleans Rugs and Carpets right on the floor —safer—better—at LESS COST. Restores the original lustre and vivid color to your rugs and carpeting via the Lincoln on-the-floor shampoo method. Rugs or tacked-down carpeting are cleaned right on the floor—actually a complete rug cleaning plant in *one* machine that shampoos and cleans in a single operation. Driven by a powerful constant speed motor, a cushion of quick-acting lather quickly dissolves and releases all imbedded grease and soil accumulations. NO SOAKING—NO RINSING—NO SIZING. Clean rugs at night—use them the very next morning!

Gently shampoos rugs and carpets to new lustrous beauty

The Lincoln Super HIGH SPEED 9 SANDER

Fast Cutting—High Speed—Light Weight

Combines fast-cutting with light weight and high speed. Operates on ordinary lighting circuits. Completely dustless in operation. Sands right up to the quarter-round moulding. Perfect balance gives operator direct control of cutting with only light pressure required at handles—remarkably easy to operate. Especially valuable for a variety of floors of different materials and of different age and condition. Sands old, warped, worn wood floors to reveal the hidden surface of smooth new wood. Comes equipped with full 3/4 H.P. G.E. capacitor motor.

WRITE—tell us the size and material of your floors and we will make cost-free recommendations

Representatives in All Principal Cities

LINCOLN-SCHLUETER FLOOR MACHINERY COMPANY, Inc.

1258 WEST VAN BUREN STREET **CHICAGO 7, ILLINOIS**

World's Manufacturer of the Most Complete Line of Floor Maintenance Equipment

PORTER-CABLE MACHINE COMPANY

3000 N. Salina Street, Syracuse 8, N. Y.

PORTER-CABLE PORTABLE POWER TOOLS CUT TIME AND COSTS IN SCHOOL MAINTENANCE

TYPE BG-10 (with dust bag)

TAKE-ABOUT SANDER

This easy-to-use sander will remove old varnish, shellac or other surface-finishing gums, lacquers or paints right down to the grain of the wood without the use of costly and inflammable removers. Its use eliminates inefficient hand-sanding and scraping. Cuts down, or smooths down worn surfaces with greater ease and control than by planing.

Fastest . . . and most satisfactory tool for refinishing desks, blackboards, chair arms, etc. The ideal tool for fitting screens, storm sash and doors, and for correcting binding doors and sash.

1 H.P. cool running motor. Balanced for easy handling. Finger tip trigger switch. Quick change 3″ belt. Easy adjustment. Weighs only 23 lbs. Price $148.00. Other types $57.00 and $99 50.

SPEEDMATIC SAW . . .

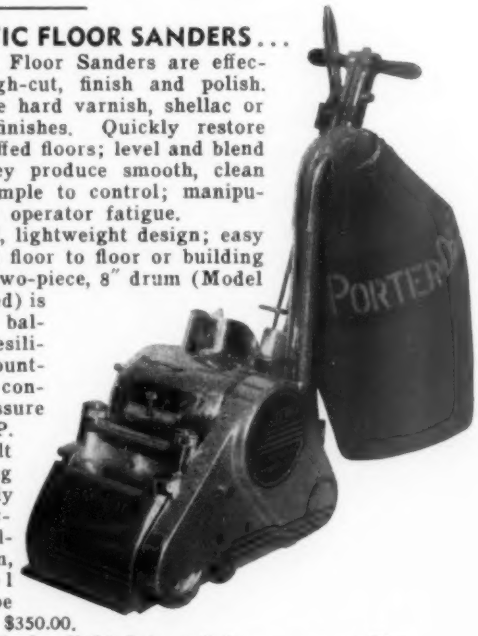
A true-cutting, powerful saw, designed and balanced for easy, safe, one-hand use. Thumb screw adjustment for angle and depth of cut. Broad guide-shoe prevents tilting and veering and rests saw firmly on work after cut-off has been made. In-line helical drive delivers more power to the blade and prevents wrist twist and torque strains.

Speeds up cutting and fitting in carpentry alteration and repair. Frequently does work *right on the job*, that previously was done on remotely located bench saws.

Sizes: Model No.	Depth of Cut	Price
A-4	1¼″	$ 49.50
K-75	2½″	116.00
K-88C	2¾″	129.00
BK-10	3¾″	162.00
BK-12	4⅝″	195.00

SEE PORTER-CABLE PAGE IN SHOP SECTION OF THIS ISSUE FOR OTHER USEFUL MACHINES

SPEEDMATIC FLOOR SANDERS . . .



Speedmatic Floor Sanders are effective for rough-cut, finish and polish. Easily remove hard varnish, shellac or other floor finishes. Quickly restore worn and scuffed floors; level and blend patches. They produce smooth, clean work; are simple to control; manipulated without operator fatigue.

Streamlined, lightweight design; easy to move from floor to floor or building to building. Two-piece, 8″ drum (Model F-89 illustrated) is dynamically balanced and resilient-rubber mounted. Ratchet-control drum pressure unit. 1½ H.P. motor; vee-belt drive. Sanding belts quickly changed. Effective dust collecting system, with swivel head dust pipe elbow. Price $350.00.

Other models for light duty and large-area sanding.

Sizes: Model	Width of Cutting	H.P.
R-8	8″	1½
F-89	8″	1½
F-10	10″	2
CF-12	12″	2

FLOOR EDGER, MODEL BE-7

The Porter-Cable Disc Edger BE-7 saves countless hours of costly and tedious hand sanding and scraping of stairs, closets, corners and edges.

Removes old varnish, paint and shellac . . . leaving a smooth, *clean* surface without dust and dirt accumulation. High speed operation blends finished edges with main surface perfectly.

Equipped with shielded electric light. Two ball-bearing swivel casters glide this edger over the work, while you guide it by two convenient handles. Quick change abrasive disc. Weighs only 25 pounds. 1¼ H.P. Price $160.00.

Model E-6, ¾ H.P.—$147.00. Model E-17, 1½ H.P.—$165.00.

HANDY GRINDER MODEL N-2

Quickly converts any ordinary bench grinder into a speedy, accurate abrasive belt grinder. The N-2 does: (1) light contact grinding; (2) platen grinding; (3) irregular surfacing. It is quickly and easily adjustable for belt positions anywhere within arc of 90°. Price $39.50.

SPECIFICATIONS: Overall height, complete attachment—27″. Width of frame—2½″. Size of base—6″ x 7″. Adjustable platen—2″ x 4″. Abrasive belt—2″ x 48″ (1″ or 1½″ optional). Shipping wt.—19 lbs. No motor furnished.

GENERAL ELECTRIC COMPANY

APPLIANCE AND MERCHANDISE DEPARTMENT

Bridgeport, Connecticut

This thorough vacuum cleaner cuts your costs two ways!

Check the advantages of General Electric's new Industrial-Commercial Vacuum Cleaner

Eliminate the mop, the pail, the broom. This double-duty cleaner picks up water as well as dirt.

Reduces cleaning costs two ways: First, General Electric's new heavy-duty cleaner has so thorough a cleaning action that floors, rugs, and linoleum are protected against wear . . . actually *last longer!*

Second, this machine is built and tested by General Electric to assure *long life*, efficient service. It's equipped with the G-E motor, and backed by the company warranty.

Simple to operate. One man can work this machine with *no previous training.* All accessories provided by General Electric, plus special tools for cleaning hard-to-reach places.

Furnace cleaners, too! General Electric also makes the G-E Furnace Cleaner, that removes soot and scale from furnace interiors quickly and efficiently.

• • •

For Further Information, write for literature concerning:

Wet and Dry PickUp Vaccum Cleaner
Furnace and Boiler Cleaner

A & M Department, Section 161
General Electric Company
Bridgeport 2, Conn.

The New General Electric

COMMERCIAL VACUUM CLEANER

FAST • EFFICIENT • QUIET • ECONOMICAL

GENERAL ELECTRIC

THE SPENCER TURBINE COMPANY

Hartford 6, Connecticut

THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

1. A vacuum producer, located in the basement. 2. Inlet valves, conveniently located on all floors and piped to vacuum producer. 3. Specially designed, entirely enclosed, and easily cleaned separator. 4. Light weight, flexible hose. 5. Special vacuum tools for each operation.

Advantages—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortization costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 HP Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

For Cleaning Erasers and Chalk Trays—Spencer Vacuum Cleaning, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system, it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

In Boiler Rooms—Spencer Vacuum keeps boilers working at top efficiency by cleaning soot out of boiler tubes, in this way often saving the cost of the entire installation within a few years. Spencer Vacuum also keeps boiler room floors clean, and easily removes soot and dust from overhead pipes.

SPENCER PORTABLE VACUUM CLEANERS

Spencer Portables built on the same principles of design and using the same vacuum tools are available in sizes from ⅓ HP up. The ¾ HP unit illustrated is used extensively in schools. It has a large capacity dirt can which may be dropped to the floor by pressing the foot cam, and then rolled on its own casters to any point. Large bag area is cleaned by shaking without removing. Machine on large wheels, turns easily in small space.

SOLVAY SALES DIVISION

ALLIED CHEMICAL AND DYE CORPORATION

40 Rector Street, New York 6, N. Y.

BRANCH SALES OFFICES:

BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON
NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SYRACUSE

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

CALCIUM CHLORIDE

GIVES YOU LOW-COST

Dust Control

On play fields, school grounds, college campuses—on all recreational surfaces—dust is always a source of annoyance. It hinders players, spectators—everyone concerned! And yet it can be eliminated so easily; usually, just one inexpensive application of SOLVAY Calcium Chloride will free your grounds from dust. SOLVAY Calcium Chloride is clean, colorless, odorless. It's easy to use . . . no experience or special equipment is needed. Proven by over thirty years of satisfactory performance. And it's *low in cost!* Solve *your* dust problem with SOLVAY Calcium Chloride.

GRAVELY MANUFACTURING COMPANY

Box 252, Dunbar, W. Va.

GRAVELY 5HP TRACTORS MEAN LOW-COST, YEAR-ROUND MAINTENANCE

17 ATTACHMENTS for EVERY School Need

Your year-round maintenance problems can be solved by using GRAVELY Power Equipment. Mowers, both 30 inch and 72 inch Gang Units; Sicklemower for high grass and weeds; 48 inch Snow Plow for your walks and drives; Spraying, Rolling and Cultivating Equipment—17 attachments in all.

GRAVELY IS FIRST CHOICE OF SCHOOLS AND UNIVERSITIES

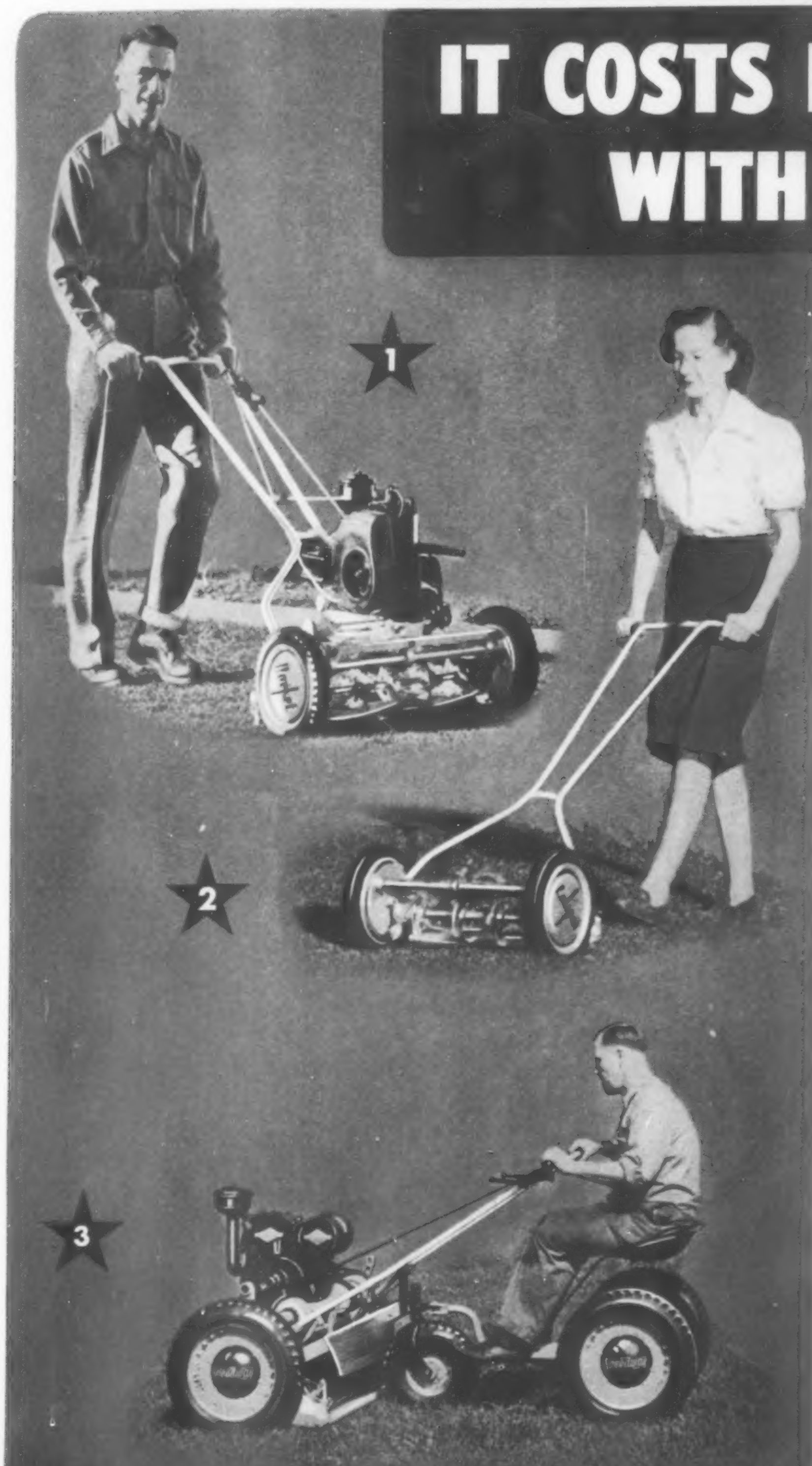
Because: the GRAVELY has DIRECT GEAR DRIVE to all power attachments, a REVERSE, AUTO TYPE TRANSMISSION, 5 HORSEPOWER MOTOR. SERVICE is always available through an authorized GRAVELY Sales and Service agency in your vicinity. Also, remember that GRAVELY has a reputation—that of the World's Finest 5 Horsepower Tractor—gained by user acclaim since 1922.

Write for our NEW, FREE CATALOG, Power Vs. Drudgery

THE ECLIPSE LAWN MOWER COMPANY

Factory and General Offices: Prophetstown, Illinois

IT COSTS LESS WITH THE BEST



In the long run, trouble-free mowing perfection combined with operating economy of your Eclipse Lawn Mowers makes even the low first cost secondary.

Durable rugged construction engineered for simple handling ease assures extended service with little or no maintenance.

Of course, it takes a little longer to get all the quality that goes into every Eclipse. So yours may not be immediately available. That's why we suggest placing your order now to get the best at the earliest date.

1

ECLIPSE ROCKET... Popular favorite because of its operating economy, durability and performance. Finger tip control, heavy duty reel, oil tempered knife and natural grip all steel handles are among distinctive features.

2

ECLIPSE MODEL L... In 16" and 18" size, this 5 blade hand model offers exclusive finger tip adjustment, automatic sharpening, natural grip all steel handle and many other outstanding features.

3

ECLIPSE SPEEDWAY... Fastest by far, this model mows a 32" swath, 200 yards long per minute by actual stop watch timing. Unmatched for time and money saving large area mowing.

Eclipse

THE WORLD'S BEST LAWN MOWER

HAND AND POWER MODELS

THE ECLIPSE LAWN MOWER CO.

Subsidiary of Buffalo Bolt Co.

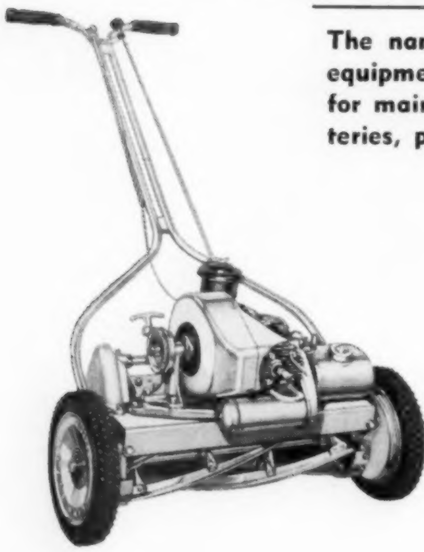
PROPHETSTOWN, ILLINOIS

JACOBSEN MANUFACTURING COMPANY

Racine, Wisconsin

SUBSIDIARIES

WORTHINGTON MOWER COMPANY — STROUDSBURG, PA.
JOHNSTON LAWN MOWER CORPORATION — OTTUMWA, IOWA



The name Jacobsen is synonymous with finest quality grass-cutting equipment. There's a right size and type mower for every lawn—for maintenance of school and university lawns, park systems, cemeteries, public institution grounds, golf courses and other large areas.

LAWN QUEEN

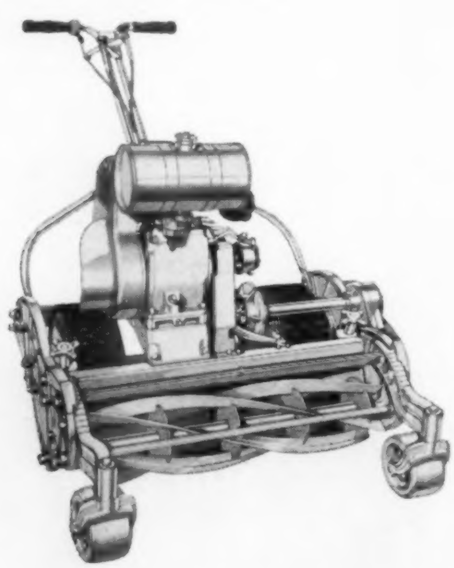
20-Inch Cutting Width 1 1/4 hp. Jacobsen Engine

Thrifty performance, operating ease, and matchless dependability are built into the Jacobsen Lawn Queen. Its powerful engine guarantees abundant power on slopes, terraces, and wide expanses of long, tough grass. The cutting unit and sturdy chassis are precision built to resist wear and strain. Excellent for school ground use, the Lawn Queen will give years of smooth, easy, economical performance.

LAWN KING

26-Inch Cutting Width 1 3/4 hp. Jacobsen Engine

Fast starting, smooth running, dependable, the Jacobsen Lawn King has ample reserve power to handle the tough jobs in stride . . . steep slopes and wide open areas offer no cutting problems. Despite its top-to-bottom rugged construction for great strength, only a light touch is needed to maneuver the easy handling Lawn King. For increased daily cutting, attach a riding sulky to the powerful Lawn King. The sulky is a real labor cost saver on the big areas.



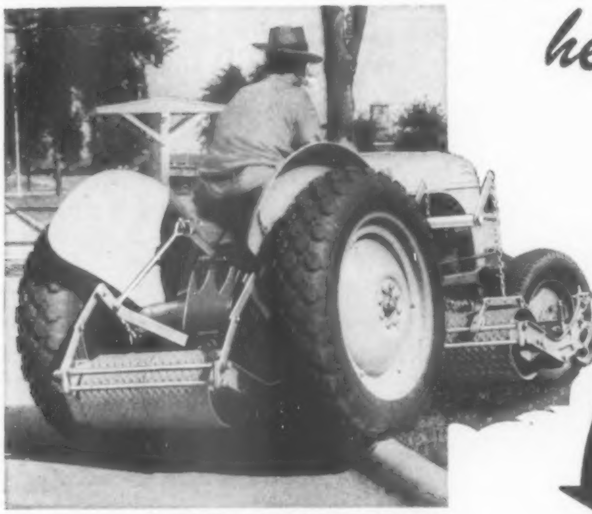
PARK 30

30-Inch Cutting Width 3 hp. engine

The Park 30 is designed for large area, grass-cutting service. With drive wheels in rear, it cuts close to trees, flower beds, buildings . . . eliminates much tedious hand trimming. Its narrow, overall width permits close quarter mowing not possible with side wheel type units of equal cutting width. A big capacity unit in itself, the Park 30 will handle even more work with a riding sulky attached due to decreased operator fatigue and longer periods of fast, steady mowing.

ROSEMAN MOWER CORPORATION

Evanston, Illinois, U. S. A.



CURBS EASILY MOUNTED. ROADS AND STREETS QUICKLY CROSSED

here is the last word in

EFFICIENT
FLEXIBLE
LABOR SAVING

low cost

MOWING!

PARK CHALLENGER

3 ROSEMAN Roller Drive MOWERS Used with the FORD TRACTOR

The PARK CHALLENGER is the answer to reduced maintenance budgets and increasing labor costs. The ability to mow all the grass, at all the locations, more quickly and economically, and at the same time develop a smoother and better turf are features that the PARK CHALLENGER offers to you.

CHECK THESE PARK CHALLENGER FEATURES

- Finger Tip Hydraulic Control Raises Mowers Instantly
- Cuts Ahead Of Rear Wheels. No Looking Back. Direct Operator View At All Times
- Outstanding Maneuverability. Curbs Easily Mounted
- Improved Roller Design. Greater Traction. Smooth Luxuriant Turf
- Low Operating Costs. Mows All The Grass—Quickly and Economically
- Designed to attach or detach in a few minutes' time, thus freeing the tractor for any of its many other uses
- No Extra Help Required. One Man Does It All

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ROSEMAN MOWER CORPORATION
EVANSTON, ILLINOIS U. S. A.

DESIGNED TO OVERHANG CURBS WITHOUT DROPPING OFF. NO UNSIGHTLY FRINGE

ROSEMAN MOWER ELIMINATES THE NEED FOR EXPENSIVE EQUIPMENT AND HAND LABOR

ROSEMAN HOLLOW ROLLER MOWERS

STANDARD MFG. & SALES COMPANY

Lebanon, Indiana

STANDARD POWER MOWERS

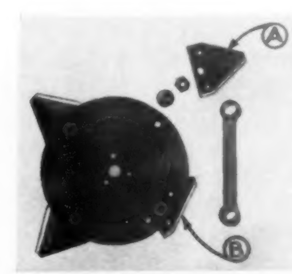
Large schools, colleges, parks and estates use STANDARD Power Mowers

Solve Every Mowing Problem Without Any Attachments

THE STANDARD ROTARY CUTTER

Has been on the market for 14 years, and operated under the hardest kind of service. Used by colleges, parks, schools, large estates, cemeteries, Government facilities, etc. Some individual users have as many as 24 of these mowers in use and are still replacing other mowing equipment with Standard Mowers. Standard Power mower has been developed into the most versatile cutting device in the field — cutting lawn-grass, dandelion, buck-horn, Johnson grass or any other standing growth without cumbersome attachments. It will cut evenly at any height; permits high mowing.

Model	Width of Cut	H.P.	No. Cutters	Capacity
Model 1	25 inches	4	2	5- 6 Acres
Model 2	30 inches	4	2	6- 7 Acres
Model 3	37 inches	6	3	7- 8 Acres
Model 4	48 inches	6	4	9-10 Acres
Model 5	62 inches	6	4	10-12 Acres



Standard Cutter Disc Assembly
Your attention is directed particularly to Standard's unique disc, secret of the remarkable performance of Standard mowing.

Leaf Pulverizer attachment for Standards only. Will Pulverize leaves any depth—put them back on ground unnoticeable

Mowing in a Big Way—Two 5-foot Mowers and Trailers

An Answer to Your Snow Problems

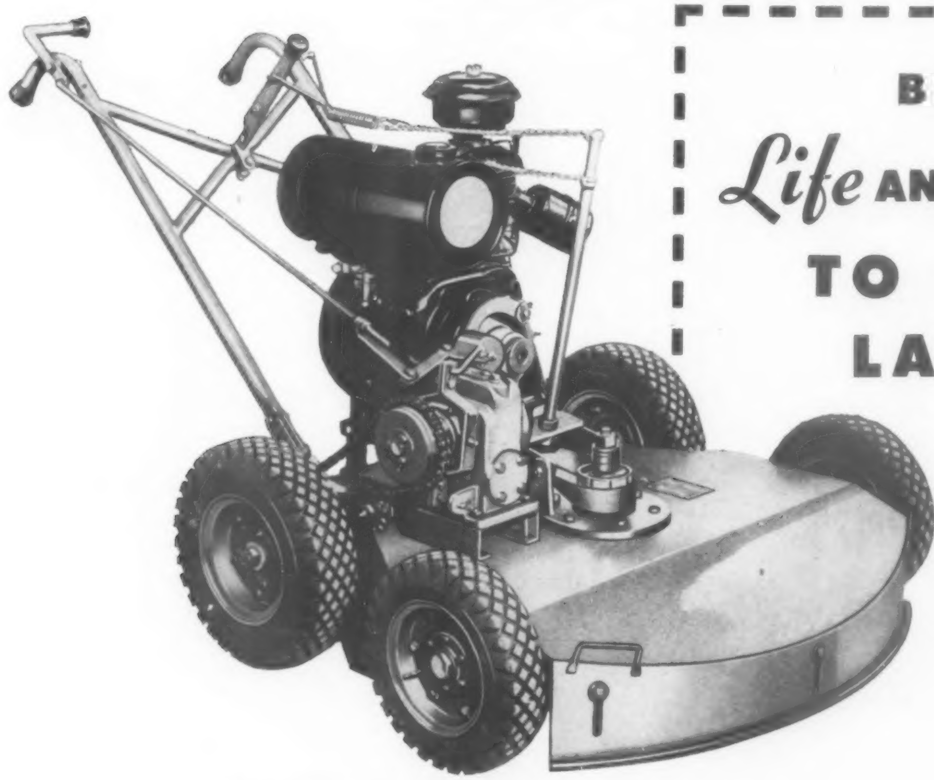
The Poynter Mower for Small Lawns and Trimming. Size 20 Inches

WHIRLWIND CORPORATION

Manufacturers of

Rotary Scythe, Suction-Lift Power Lawn Mowers

3707 N. Richards Street, Milwaukee 12, Wis.



BRING *Life* AND *Beauty* TO YOUR LAWNS

• Grass King — 31-inch cut; powered by 6 hp. 4-cycle air-cooled engine. Cuts 6 acres per 8-hour day.

ROTARY - SCYTHE, SUCTION-LIFT CUTTING ACTION . . . PROVED THROUGH A 16 - YEAR SERVICE RECORD

use WHIRLWIND POWER MOWERS

TRADE-MARK Reg. U. S. Pat. Off.

Whirlwind Power Mowers will do these things for your lawns:

1. Cut grass and weeds of any height. Rotary action cuts like a scythe, no matter how tall the growth.
2. Cut grass and weeds in any condition. Matted and tangled masses are lifted by suction and uniformly cut.
3. Cut clippings into a fine mulch for the turf. Allows tender grass to breathe and thrive.
4. Trim under low-hanging shrubbery and up close to trees, walls, fences, monuments, walks and flower beds. Reduces hand-trimming.
5. Cut with equal efficiency on both forward and backward travel. No lost motion.

What more could you ask? Whirlwind's ability to meet all grass-cutting situations is acclaimed by thousands of satisfied users. Write for complete descriptive literature and name of our dealer nearest you. Address Dept. ASU-48.

• Model SP — 24-inch cut; ideal for general lawn maintenance. Powered by 3 hp. 4-cycle air-cooled engine. Cuts 4 acres per 8-hour day.

WHIRLWIND CORP., 3707 N. RICHARDS ST., MILWAUKEE 12, WIS.

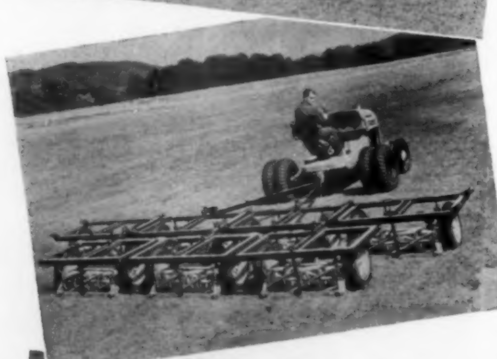
WORTHINGTON MOWER COMPANY

Stroudsburg, Pennsylvania

Subsidiary of Jacobsen Manufacturing Company • Racine, Wisconsin

Worthington Mowers for Every Large Area Job

Pioneer manufacturer of big capacity gang mowers, Worthington furnishes units to schools and universities where spacious ground areas require big capacity mowers. Experience has shown that Worthington mowers do the job better, faster and at less cost than with other methods.



1. CHIEF

The fast, powerful Chief tractor is specifically designed for high speed hauling of multiple gang mower combinations. In addition, its power takeoff handles sweeper, sprayer, mixer, etc., attachments. When not on mower duty it is useful for countless hauling jobs. 100 hp. engine—4 speeds, 1.5 to 47 m.p.h.

2. STANDARD FAIRWAY MOWER

Available in 3, 5 or 7-gangs, the smooth-cutting Fairway gang mower keeps large grass areas in excellent condition—7-gangs mow up to 88 acres per day. Individual gang units may be quickly added or withdrawn. No tools are needed to adjust cutting units and lubrication is required only twice a year.

3. GRASS BLITZER

For really high speed, peak capacity mowing, choose the Grass Blitzer. A 9-gang unit mows up to 368 acres per day at 20 m.p.h. —7-gang, 288 acres. Ruggedly built, it speeds over hills and uneven ground in a manner impossible with conventional mowers, yet always gives a smooth, even cut. Available in 3, 5, 7 and 9-gang units, there's a size and capacity to fit every need.

4. RANGER

The Worthington Ranger consists of a Worthington Grass Blitzer type, triple gang mower with its own hydraulically operated transport wheels. A touch of the controls raises the entire gang mower and lowers the transport wheels—makes possible a travel speed of 45 m.p.h. This unit is ideal for mowing on campuses with widely separated lawn areas.

Additional Worthington equipment includes dump carts and dump body tractors and sickle bar. Write for descriptive literature.

ANCHOR POST FENCE DIVISION

ANCHOR POST PRODUCTS, INC.

Complete Line of Fences and Playground Equipment

6695 Eastern Ave., Baltimore 24, Md.

SALES OFFICES IN PRINCIPAL CITIES

ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

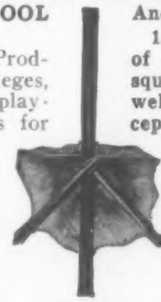
The Anchor Post Fence Division of Anchor Post Products, Inc. has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for half a century.

Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Division today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. **Ask for Catalog No. 110.**

Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Division is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our **Catalog No. 111.**



Anchor Drive-Anchorage

Anchor's Four Features

1. **ANCHOR-WELD WIRE GATE—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no re-enforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.**

2. **SQUARE TERMINAL POSTS—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.**

3. LINE POSTS—choice of U-Bar, H-Beam, or Pipe.

4. **DRIVE-ANCHORAGE—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.**

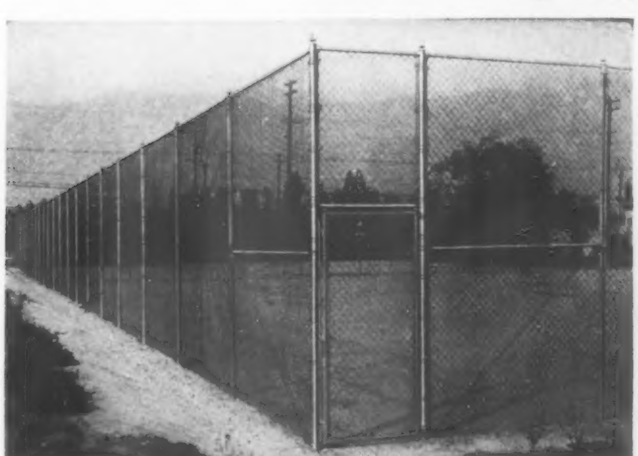
Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.

Anchor-Weld Wire Gate

Anchor Chain Link Fence with Top Rail High School, Mineola, N. Y.

Anchor U-Bar Line Post

Anchor Square Terminal Post



Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.

Anchor-Weld Fence Surrounding St. Anne's School, Fall River, Mass.

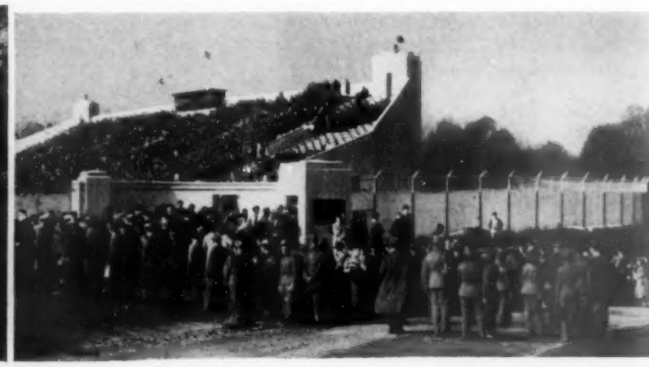
CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

General Office: Kokomo, Indiana

SALES REPRESENTATIVES IN THE FOLLOWING CITIES

Alexandria, Austin, Atlanta, Canton, Chicago, Columbus, Dallas, Dayton, Des Moines, Detroit, El Paso, Evansville, Ft. Wayne, Grand Rapids, Indianapolis, Kansas City, Louisville, Minneapolis, New Orleans, New York, Norfolk, Oklahoma City, Omaha, Philadelphia, Richmond, San Antonio, South Bend, St. Louis, St. Paul, Toledo, Tulsa, Wichita



COMPLETE CHAIN LINK FENCE

To meet the fencing requirements of schools and universities, Continental has developed a wide range of structural variations in its Chain Link fence. The selection in styles, heights, types of top construction, gates and accessories makes it possible for schoolmen to select the best fence for any installation.

MADE OF KONIK STEEL

FABRIC OF KONIK STEEL

The wire fabric in Continental Chain Link fence is made of KONIK—a new steel containing copper, nickel and chromium for greater strength and rust resistance "clear through." This superior fence fabric carries a zinc coating applied by a special hot dip process to insure uniformity and adhesion of the coating to the base steel. A uniform, bright finish enhances the appearance of Continental fence fabric. Wire is full gauge and woven in exact mesh.

TAILORED TO FIT SCHOOL PROPERTY

Experienced fence engineers plan and help erect Continental Chain Link fence anywhere. No matter what your property protection problem, Continental engineers will work with you in laying out the most effective and economical installation—planned to harmonize with the character of school property, and provide the type of protection you want.

12 STYLES

Continental offers 12 styles of top construction for Chain Link fence. Six popular styles are illustrated to the right. Continental fence is engineered for each specific job.

POSTS AND FITTINGS

Continental fence has heavier, sturdier posts with improved brace construction. Top rails are joined by a special Inside-Outside coupling. Post caps and barbed wire arms are sturdy, heavier. Self-locking slots hold barb wire. New type lock pin eliminates bolts and nuts for fastening fabric to tension bands.

GATES

Strong and easily operated gates and locking devices. Single and double types with improved pivot type hinges. Manually or mechanically operated.

ENGINEERING AND ERECTION SERVICE

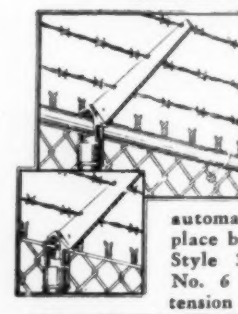
Our engineers are prepared to assist you in laying out the most economical installation for your purposes. Trained erection crews are available for correct and economical construction anywhere. When local labor is used Continental will supply competent foreman and inspection service.

SEND FOR FREE MANUAL

This file size book contains more than 100 illustrations, will help you evaluate fence protection, select right style of fence. Write the

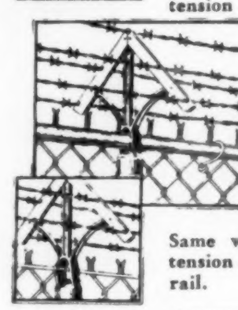
CONTINENTAL STEEL CORPORATION
KOKOMO, INDIANA

A STYLE TO MEET EVERY SCHOOL NEED



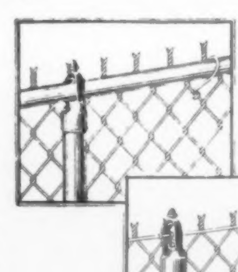
Style 3B - R—Three strands of barb wire with top rail. Arm of 12 gauge pressed steel. Barb wire held in angle slots and automatically locked in place by tension.

Style 3B-W—Same with No. 6 gauge coil spring tension wire instead of top rail.



Style 5B - R—Five strands of barb wire with top rail. Top rail of tubular steel 1⅝" O.D. Has 7" expansion sleeves.

Style 5B - W—Same with No. 6 gauge tension wire instead of top rail.



Style NB - R—No barb wire with top rail.

Style NB-W—Same with No. 6 gauge tension wire instead of top rail.

CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

CYCLONE FENCE DIVISION

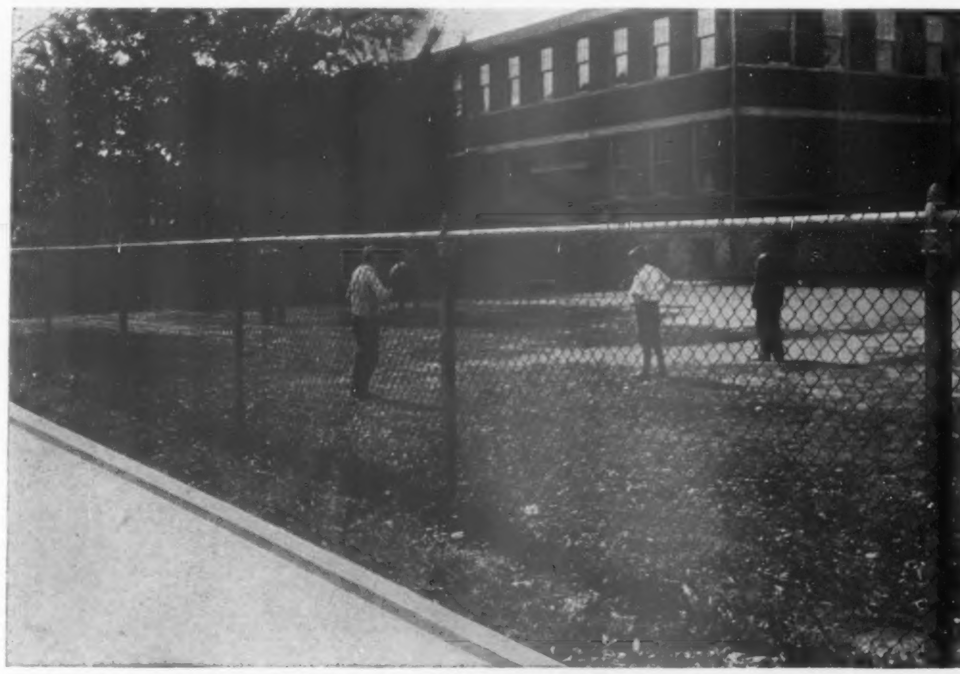
(American Steel & Wire Company)

UNITED STATES STEEL

General Office: Waukegan, Illinois

Waukegan, Ill. Fort Worth, Texas | Newark, N. J. Oakland, Calif. | Greensburg, Ind. Savannah, Ga. | DeKalb, Ill. Portland, Ore.

United States Steel Export Company, New York



Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

CYCLONE FENCE is the economical, serviceable enclosure for school yards, playgrounds, athletic fields, outdoor pools. For years Cyclone has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

School grounds enclosed with U·S·S Cyclone Fence provide maximum protection for your school children.

Athletic fields fenced with Cyclone get more paid admissions—for they permit complete control of crowds, efficient collection of tickets.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the long run. In every detail it is made for durability and long life.

Get the facts on Cyclone Fence now. Send for our free booklet: "Your Fence—How to Choose It—How to Use It." The 32-page book is packed with information you will want on Cyclone Fence, Tennis Court Enclosures and Window Guards. Ask for a free estimate. *Also ask for copy of useful folder giving detailed specifications for Cyclone Fence and other Wire Products used for School Properties.*

Cyclone Invincible Chain Link Fence for Athletic Fields

Cyclone Window Guards are sturdy—save money

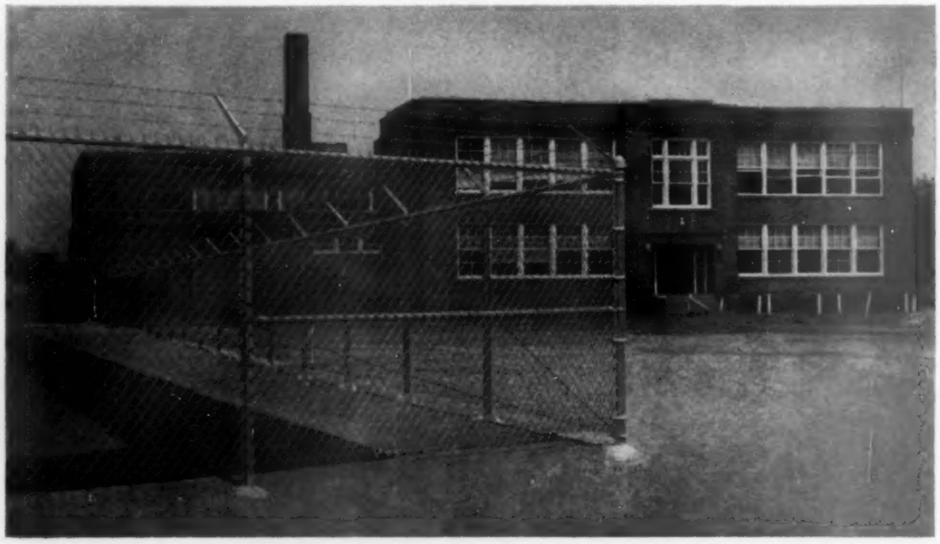
PITTSBURGH STEEL COMPANY

3237 Grant Building, Pittsburgh 30, Pa.

Pittsburgh Chain-Link Fence

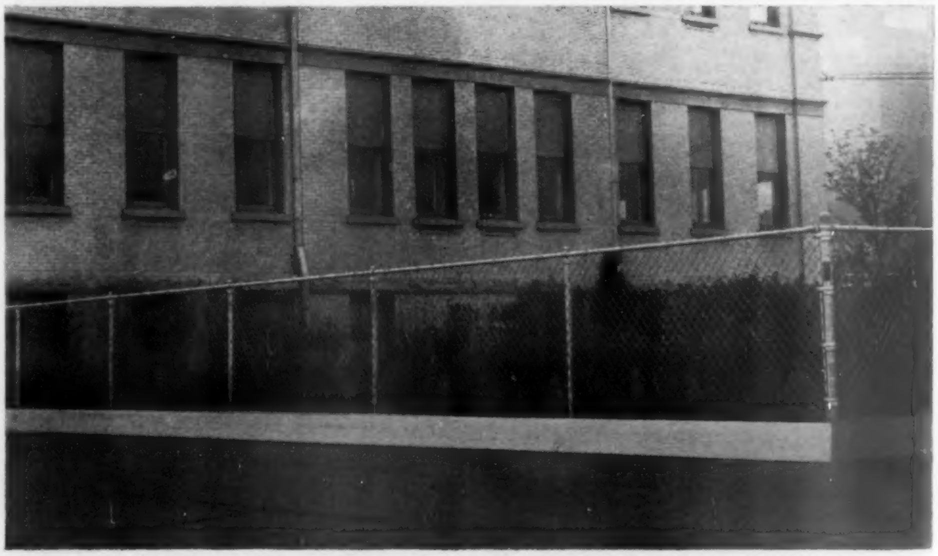
You get planned protection for your property when you order Pittsburgh Chain Link Fence. Our organization has years of experience in this specialized field. All planning and installation is done under the direct supervision of specially trained Pittsburgh Fence experts. These men are available at all times for consultation on the protection of your property whether it be school yard, athletic field, tennis courts, playground or swimming pool.

Pittsburgh Chain Link Fence is the best available. It is made of copper-bearing steel wire, heavily zinc coated after weaving. All steel pipe framework is copper-bearing and heavily zinc coated. Fittings are of malleable iron and pressed steel. Pittsburgh Chain Link Fence is available in several styles in a variety of heights and weights to meet your individual requirements. For complete information and specifications write Pittsburgh Steel Company, Chain Link Fence Department, 3237 Grant Building, Pittsburgh 30, Pa.



Pittsburgh Custodian Chain Link Fence illustrated at right is popular for protecting athletic fields and swimming pools. Adjustable barbed-wire extension arms permit placing three barbed-wire extension vertical or at a 45° angle.

★



Pittsburgh Guardian Chain Link Fence illustrated at right is popular for protecting school yards and playgrounds. Selvage of chain link fabric can be dressed above top rail or knuckled flush as desired. Other Pittsburgh Chain Link Fence types are Chieftain with five barbed-wire extension; Residential; Tennis Court Fence; Backstop Fence.

PROPERTY PROTECTION BY PITTSBURGH

THE STEWART IRON WORKS COMPANY

INCORPORATED

"Fence Builders to America Since 1886"

1503 Stewart Block, Cincinnati 1, Ohio

PRODUCTS

- Bronze Tablets
- Chain Link Wire Fence and Gates
- Flag Poles
- Folding Gates

PRODUCTS

- Iron Fence and Gates
- Pipe Railing
- Settees
- Stadium Seat Brackets
- Window Guards
- Wire Mesh Partitions

FOR EVERY PURPOSE

Stewart offers Plain or Ornamental Iron and Chain Link Wire Fence and Gates for front, side and rear property lines; for athletic fields, tennis courts, recreation grounds and other school requirements.

Stewart Chain Link Wire Fence is the only ALL BEAM FRAMEWORK construction on the market. The Chain Link

Style OTH Chain Link Wire Fence

Style 3TH

Wire Fence illustrations clearly show this exclusive feature. Notice the 3TH Oval-Back I-Beam Line Post with integral extension arm. Obviously this solid post is superior to pipe or other types of post requiring a separate pressed steel arm which may be removed or easily broken. Notice, too, that the beam top rail passes through the post itself — eliminating the need for fittings. The flat, smooth surfaces of Stewart All Beam construction offer maximum resistance to wear, weather and corrosion. This type of fence structure, exclusive with Stewart, is the heaviest and strongest manufactured.

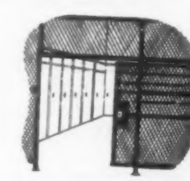
Usual heights of style 3TH shown in illustration are 7 ft. and 8 ft. overall. All materials are of Copper-Bearing Steel hot-dipped galvanized *after* fabrication to assure greatest possible resistance to rust.

IRON FENCES AND GATES

For front property lines where dignity as well as protection is a requisite, Stewart offers a multiplicity of designs in plain or highly ornate iron. Here again Stewart construction is unique. The patented channel rail, exclusive with Stewart, adds immeasurably to the strength of the fence. All fittings are of Stewart design—the result of 60 years' experience and research in the fence building field.

WIRE PARTITIONS

Effective and economical enclosures for locker rooms, stock rooms, supply rooms, toolrooms, machinery, power houses, etc. When writing for prices please send sketch giving measurements.



BACKSTOPS

Ideal for hard or soft baseball diamonds, tennis and badminton courts, etc. Sturdily constructed to stand the toughest abuse. Literature and prices furnished on request.

BRONZE PLAQUES

Plaques and tablets of hand-chased cast bronze, are available in stock sizes from 9" x 16" to 24" x 36". Special sizes will be made to order. Literature and prices gladly sent on request.

CATALOGS — SALES AND ERECTION SERVICE

Literature is available on all Stewart products. If interested in Chain Link Wire Fence ask for Catalog No. 79. If in Iron, ask for Catalog No. 81. When requesting catalogs, please indicate products in which you are primarily interested.

Stewart maintains sales and erection offices in all principal cities. Consult your local classified telephone directory or write direct to factory.

WICKWIRE SPENCER STEEL DIVISION

THE COLORADO FUEL AND IRON CORPORATION

Realock Fence Sales Headquarters: 361 Delaware Avenue, Buffalo 2, N. Y.

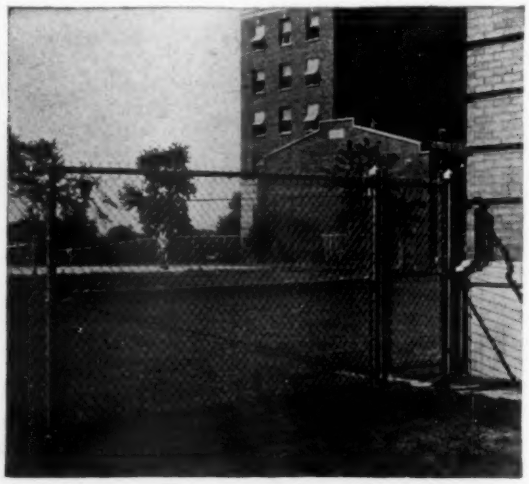
SALES OFFICES

BOSTON • CHICAGO • DENVER • NEW YORK

Pacific Coast Subsidiary: THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND, CALIF.

DISTRIBUTORS AND ERECTORS IN PRINCIPAL CITIES

Realock Fence is available for all types of property, including schools, playgrounds, athletic fields, tennis courts, etc. Manufactured entirely in our own plants with complete control from mine to consumer. Sold with complete installation, or if preferred, we will furnish all necessary materials to be installed by others or with the services of a supervising foreman. All posts are furnished to set in concrete footings. (Concrete preserves the metals from corrosion below the surface.) All materials except non-ferrous metals are hot galvanized after fabrication.



Realock Type 420H Fence, using "H" section line, end, corner and gate posts. A design virtually foolproof as no bolts or nuts are exposed for possible tampering. Gates of similar construction using heavy square tubing with specially reinforced heavy hinges and locking devices. If desired, this type of fence is available with copper bearing pipe posts throughout.

Realock Tennis Court Design. Illustration shows a typical Tennis Court Fence design. Two types are available—310 (light construction) and 420 (heavy construction). Standard heights, 8', 10' and 12'.

Realock Type 425 Fence. Same as Type 423, except that five strands of barbed wire are used, supported by a triangular arm.

Realock Type 423 Fence with three strands of barbed wire. Illustration shows pipe posts throughout. Gates to match. This type is also available with "H" posts same as shown in Type 420H illustration, with gates of similar construction.

FREE ESTIMATES. Our representative in your locality will be happy to cooperate in helping solve your fencing problem. Without obligation he will measure the property, draw up specifications and submit estimates for fence material ready for erection or covering complete installation. Write to our nearest office for full details.

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

GET DETAILS

about INTERNATIONAL School Buses

In the complete International Line is a chassis of exactly the right size and power to handle your transport efficiently and economically.

From your International Branch or Dealer you will get expert help in fitting this chassis exactly to your needs.

And from your International Branch or Dealer you will get details of the many features and improvements incorporated in the brilliant International KB Chassis—the finest in 41 years of International history.

So consult your International Branch or Dealer no matter when you will purchase or what your school transport problem.

Tune in James Melton on "Harvest of Stars." CBS Wednesday

Motor Truck Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

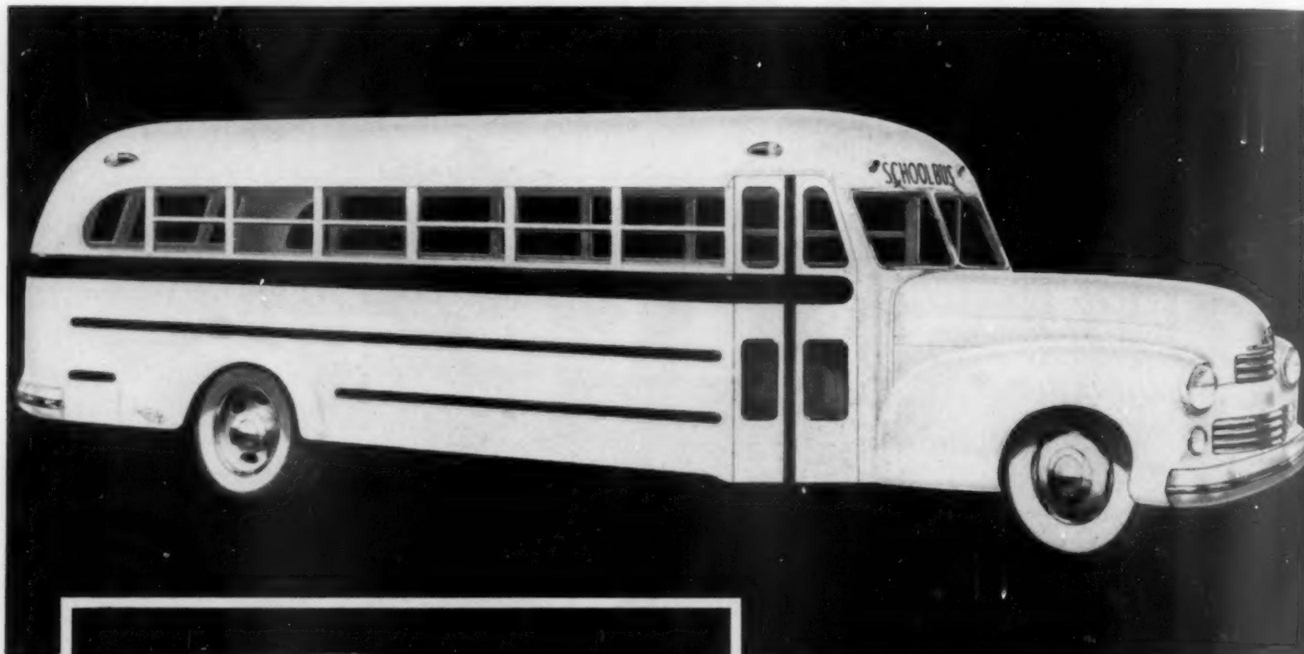
IH

SUPERIOR COACH CORPORATION

Lima, Ohio

FOR BETTER STUDENT TRANSPORTATION

Choose the Coach that's 1st in the Field



The Superior "Pioneer" All-Steel Safety Coach is 96 inches wide with 68-inch headroom. The "Pioneer" is available in a choice of lengths and seating arrangements for any standard truck chassis.

The Superior "Pioneer" equipped with baggage rack and individual reclining seats for trips of athletic teams, bands and other school groups.

First in Safety, first in comfort and first in ruggedness, too! That's the Superior "Pioneer," choice of schools and colleges everywhere for safe, comfortable, economical student transportation.

Such features as Superior's All-Steel Safety body with "Unistructure" frame, seat-to-seat pillar spacing, double strength dual steel rub rails, split-frame safety sash, 6-inch chassis attached bumpers, box-type steel understructure and a score of other safety and structural advantages make Superior coaches the outstanding buy in the field.

The Superior "Pioneer," the all-purpose safety coach for students, is available in standard body sizes, with a choice of seating arrangements and capacities. The Superior "Pioneer" is available, or can be equipped later, with "extras" for the comfortable transportation of athletic teams, bands and other student groups. An outside baggage rack and individual reclining seats make the "Pioneer" an ideal coach for longer distances. See your Superior distributor for details or write to:

SUPERIOR COACH CORPORATION
LIMA, OHIO

SUPERIOR

SUPERIOR THE COACH THAT'S 1ST IN THE FIELD

TRANSICOACH, INC.
Richmond, Ind.

THE MOST ECONOMICAL SCHOOL TRANSPORTATION

TRANSICOACH is the modern, economical answer to the problem of mass student transportation—whether for "activities," such as athletic teams, orchestras, glee clubs, etc., or for the movement of large bodies of pupils to and from school.

Operators of commercial bus lines have long recognized that the safest, most satisfactory and most economical bus operation can only be obtained from "integral" equipment—where the body and chassis are to operate as one unit, designed to operate together, as *one unit*.

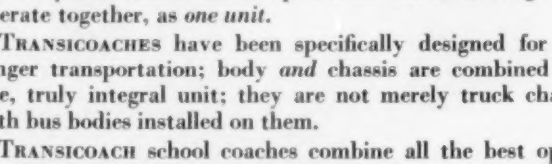
TRANSICOACHES have been specifically designed for passenger transportation; body *and* chassis are combined into one, truly integral unit; they are not merely truck chassis, with bus bodies installed on them.

TRANSICOACH school coaches combine all the best operational features of other integral buses—adequate power, compressed air-operated oversize block brakes, 12-volt heavy duty electrical system—with the safety and durability of the famous Wayne, the Nation's most popular school bus body, line-assembled, of thoroughly rust-proofed die-formed interchangeable parts. Thus TRANSICOACHES combine all of the essential operating features of the most expensive type common carrier buses in an *economical unit, specifically designed for school service.*

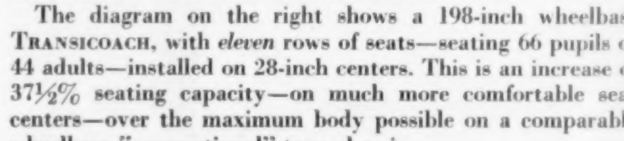
The seating diagram on the left, below, shows a "conventional" type school bus body installed on a standard 1½ ton, 195-inch wheelbase truck chassis. Only *eight* rows of seats—seating 48 primary or secondary pupils or 32 adults—may be installed on a maximum of 26-inch centers.

The diagram on the right shows a 198-inch wheelbase TRANSICOACH, with *eleven* rows of seats—seating 66 pupils or 44 adults—installed on 28-inch centers. This is an increase of 37½% seating capacity—on much more comfortable seat centers—over the maximum body possible on a comparable wheelbase "conventional" type chassis.

Your nearby TRANSICOACH Distributor will gladly quote prices and delivery.



OLD STYLE "CONVENTIONAL" SCHOOL BUS



MODERN TRANSICOACH INTEGRAL COACH

TRANSICOACH, INC. *RICHMOND, INDIANA*

Wayne
ALL METAL
MOTOR COACH BODIES

Wayne Works
RICHMOND, INDIANA, U.S.A.

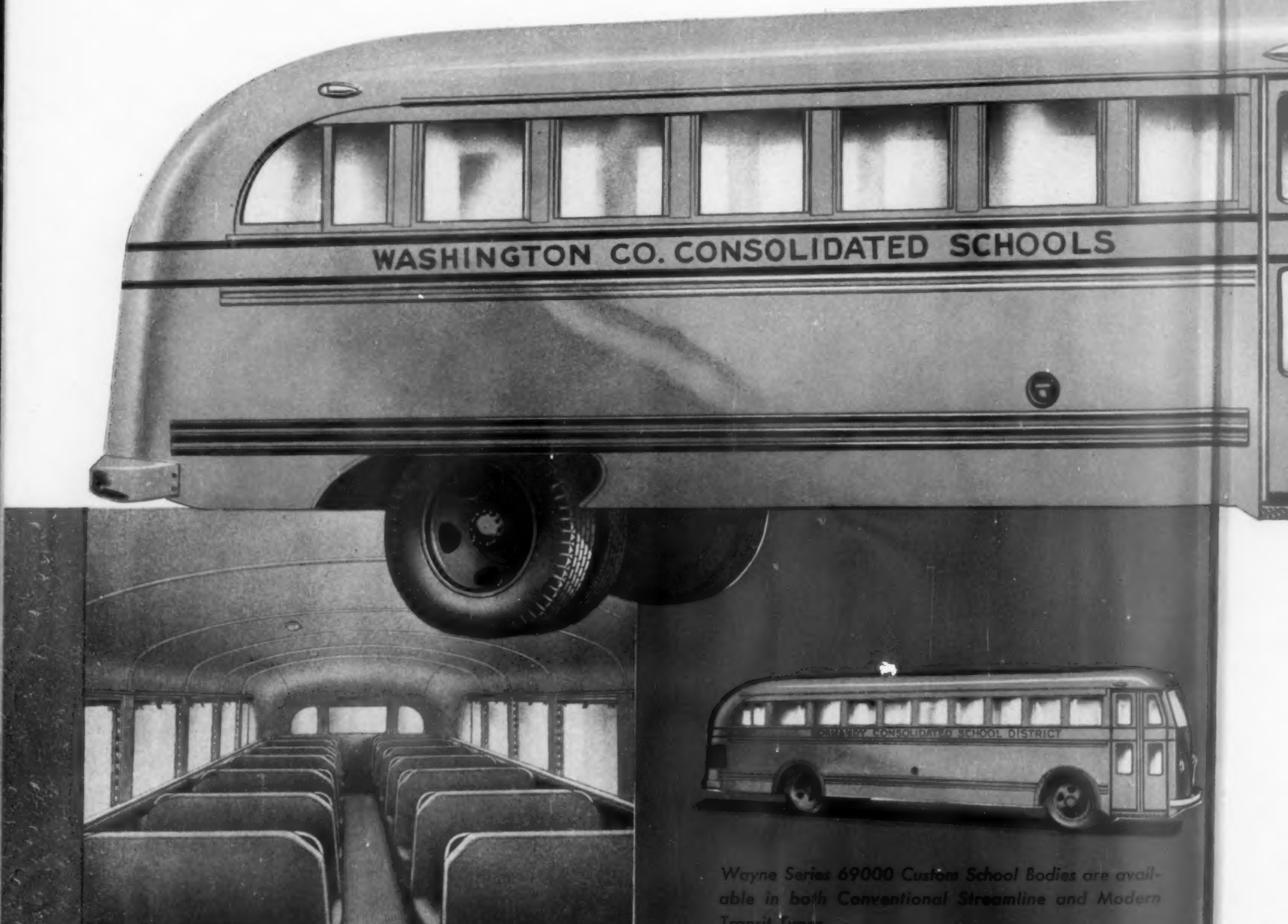
Series 69000

CUSTOM SCHOOL BUS BODIES

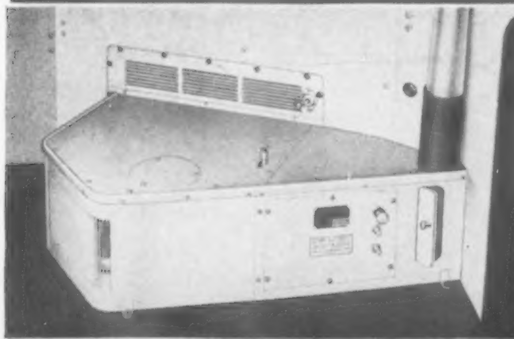
The Nation's finest!

★ Colorful harmony—striking beauty—simple elegance—luxurious comfort—greatest strength—enduring safety—outstanding value, inside and out . . . these are "extras" you get in these new Waynes. Time-tested, through-lock-bolted, flexible design, route-proven over millions of service miles . . . mass-produced and line-assembled by the world's largest manufacturer of bus bodies . . . Wayne Series 69000 Custom School Bus Bodies are truly the Nation's first choice.

Interiors are roomy and comfortable. Sturdy, safe, long-lived seats are attractively upholstered in long-wearing artificial leather or deep-buff genuine leather. Insulated sides and roofs, thorough ventilation and Wayne's guaranteed heating insure comfortable temperatures and healthful fresh air. Smooth, attractive, easily cleaned interior finish; non-slip special heavy-duty bus floor covering (smooth under seats and ribbed in the aisle) permit the maintenance of highest sanitary standards.



Wayne Series 69000 Custom School Bodies are available in both Conventional Streamline and Modern Transit Types.

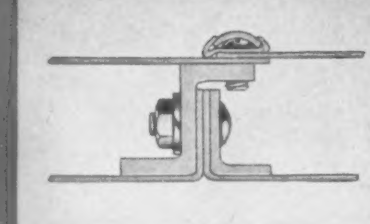


Wayne fresh air, hot water heaters are engineered for specific body models and guaranteed to operate within 4° of rated temperatures.

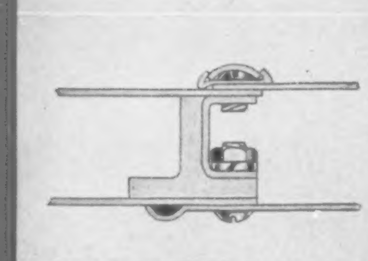
Unobstructed driver's vision is assured in the coldest weather by Wayne's efficient, inbuilt windshield defroster.

Double-reinforced, full tubular framed passenger seats are built for utmost comfort and long service.

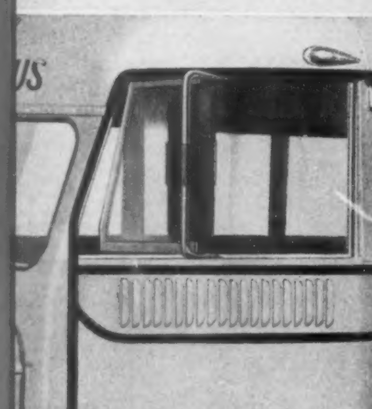
Wayne Custom Streamline School Bus Model 69050 seats 48 pupils on 27-inch seat centers.



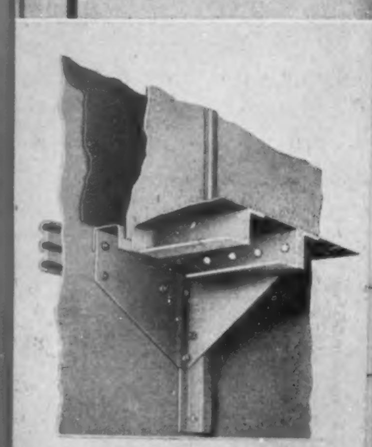
Smooth side panels are flanged and held in a vice-like grip against structural steel "Z" bar side posts.



High tensile, high elastic limit structural "T"-shaped steel roof bars provide great strength.



The driver's window is adjustable with one hand. The fresh air heater guarantees comfortably heated fresh air and supplies hot air to the inbuilt windshield defroster.



One-piece, heavy, molybdenum steel gusset plates interlock floor bars, side posts and impact rail, enabling Waynes to withstand the hardest blows, vibrations, rocking and twisting as well as the millions of lesser shocks of day-in and day-out service.

In any service, a bus laid up in the shop becomes a heavy expense item. If, for any reason, it becomes necessary to alter or repair a Wayne, you may be sure it can be done more quickly and at less cost than similar work on any other make. Even in the case of serious accident, it is only a matter of a few hours to remove and replace the damaged parts and re-install new, die-formed Wayne replacements.

SPECIFICATIONS

Series 69000 Custom Streamline School Bus Bodies

CONSTRUCTION: All steel—double walls and roof—parts precision die-formed and interchangeable, completely rustproofed after fabrication but before assembly. Airplane type through-lockbolted assembly. Thermal and sound insulation permanently applied to walls and roof.

DIMENSIONS: Exterior over-all width 96″. Interior height 68″ regular. 76″ optional, at extra cost. Lengths provided for mounting on all standard Conventional or Transit chassis of proper wheelbase length and capacity.

SEATING: Any desired seat plan at no extra cost. Forward-facing seats have full, heavy tubular frames, reinforced at corners and double-braced. Each seat rests on its own four legs, unattached to body sides. Upholstery is of long-wearing art leather. Backs and cushions, heavy cotton padding. Steel back panels. Generously proportioned driver's seat, with semi-bucket back and 19″ x 20″ cushion—fully adjustable.

DOOR EQUIPMENT: Safety, divided service door with upper and lower panels of ¼″ Hi-Test safety glass. Heavy-duty manual door control, standard. Air or vacuum door controls available at extra cost. Fully enclosed double service door step, with diamondette safety tread. Automatic light illuminates step when door is opened. Stanchion, 1¼″ steel, with safety bar to right side. Modesty panel, from door stanchion to body side. Emergency door, located in center of body rear, is hinged on right side and fitted with recessed inside door handle, placed near center.

MECHANICAL EQUIPMENT: "V"-type, sloping, divided windshield glazed with Hi-Test safety plate glass. Windows are full-framed, aluminum finish, glazed with ¼″ Hi-Test safety glass—adjustable to any position—can be permanently stopped where desired—double latch controls. All glass set in plastic. Driver's window is sedan type with large draftless ventilating wing. Two individual, heavy-duty rotary vacuum windshield wipers with emergency operating handles. Air-operated windshield wipers or electric wipers available at extra cost. Large, fully adjustable sun visor. Non-glare 4″ x 16″ rectangular rubber-edged rear view mirrors inside and outside. Sectional, transverse reinforced steel floor covered with heavy-duty mastic bus flooring, smooth on sides and ribbed in aisle. Tool box provided under right front seat. One-piece, formed steel wheelhouse; inside type to 85″ over-all rear tire width; semi-outside type for 85″ tire width and wider. Heavy, continuous, triple-shouldered impact rails and double passenger guard rails on both sides and across left front section. Padded high tensile passenger guard rail inside at shoulder line. 1¼″ driver's stanchion and guard rail. Heavy, rugged, wrap-around channel steel bumper, attached direct to chassis frame. Chassis fuel tank mounted below floor, with port for outside filling, venting and draining. Two illuminated recessed license plate holders. Body floated on mounting cushions.

ELECTRICAL EQUIPMENT: Automatic step light. Recessed dome lights, two in each alternate ceiling panel, with prism type lens. Streamlined teardrop design clearance and identification lights. Two chassis type stop/tail lights. Electrical circuits individually controlled and fused at switch block in left front post. Extra light bulb and fuse kit supplied.

VENTILATING EQUIPMENT: Evans exhaust ventilation, located in roof, near front. Draftless ventilating wing in driver's window. Steel rain visors at all side windows on 68″ height bodies.

COLOR FINISH: Interior—Wayne Tan. Exterior—National School Bus Chrome with black striping and trim standard, but any two school body colors are optional without extra charge. "School Bus" signs front and rear; "Emergency Door" sign above door, inside and out.

WAYNE WORKS • RICHMOND, INDIANA, U. S. A.

All Specifications Subject to Change Without Notice

FORM 4701 PRINTED IN U. S. A.

Wayne All Metal Motor Coach Bodies

Established 1837

"Transportation Equipment Since 1868"

WORLD'S LARGEST MANUFACTURERS OF BUS BODIES

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110 YEARS OF SERVICE

V-Type Windshield w
sign for Greater Visib

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Windshield with Universal Cowl De-
Greater Visibility, Safety and Beauty.

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THE Oneida School Bus Body gained immediate acceptance from school boards throughout the nation because of the outstanding safety features incorporated in its design, and from the date it was introduced the big problem has been one of production. This has now been solved!

Today Oneida's big, ultra-modern body plant, equipped with the most modern machinery, is complete in every detail. It has 350,000 square feet of floor space under cover.

There are five final assembly lines in
eet long and 120 feet wide, unmarred by a single post, and
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reasing numbers by school boards who wish to give the
districts the safest protection that modern engineering can

es were used on the first complete school bus to meet or exceed, in
w school bus standards adopted by the National Education Association.

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the main line of the New York
nd U. S. Highway No. 5.

★ **MORE SAFETY**

★ **MORE COMFORT**

★ **GREATER ECONOMY**

Oneida

SAFETY SCHOOL BUS BODIES

Driver's seat. The driver's seat is an important safety factor. It is adjustable up and down, backward and forward, to put the driver within easy reach of all controls. Unusually comfortable, it also helps reduce fatigue. In addition, the deluxe seat, shown here, swivels for easy exit.

Left rear emergency door. This type emergency exit door is mounted in the left rear quarter of the body and provides easy exit, while permitting a full seat across the rear of body. Door is equipped with a three-point safety releasing mechanism with warning light and buzzer. Use of this type door provides ample enclosed space for spare tire, tools, flags and flares, etc.

Entrance door. The wide entrance door with two steps permits quick, easy entrance and exit of children. Vertical edges of doors have soft rubber snubbers to protect children's fingers. A metal courtesy guard is between the entrance way and right front seat.

Center rear emergency door. Extra wide center rear emergency door, 32″ wide in the clear, meets all National and State requirements for this type emergency exit. It is equipped with safe quick-releasing device, overhead light and buzzer. Pictures show door in open and closed positions.

Interior view of seating arrangement. Seating arrangements and window openings meet State requirements. Wide aisles and high headroom are features, and all seats have built-in guards in the handholds to prevent accidents. Book racks, when installed, have padded edges above seats.

FEATURES

Oneida

TRADE MARK

DESIGN—The pleasing streamline design of the body tapers down to a new modern "universal" front cowling, specifically designed by Oneida engineers to blend more gracefully into the hood line of each of the various types of bus chassis. With the wide, angle vision, Vee type windshield, Oneida alone offers custom styling at standard prices.

CONSTRUCTION — All steel — for greatest strength—the Oneida safety school bus body has a plus factor built in to safeguard the children's lives. The extra-strong steel framework is double row welded and riveted. The body is fully insulated and the floor is of steel, reinforced with welded and riveted cross members.

MODELS—Oneida bodies are available in a wide range of sizes with both standard and deluxe equipment.

CAPACITIES—30 to 61 passengers under legal seat spacing.

SEATS—Scientifically designed for better posture and comfort, they are available with either genuine or imitation leather upholstery. All Oneida seats are of flameproof materials.

EMERGENCY DOORS—Oneida safety school bus bodies come with either of two types of emergency doors, according to requirements—center rear of bus or rear left side of bus. Both are equipped with approved safety latch, light, and warning buzzer.

WINDOWS— Available according to requirements with either two-piece or single-drop type, with stops for legal openings. Safety glass used throughout.

HEATER—When specified—hot water type, with windshield defroster, this heater features adequate capacity to maintain "comfort-zone" temperatures in sub-zero weather.

VENTILATION—Fresh air intake and exhaust system utilizes built-up pressure of moving vehicle, supplemented by two motor driven fans and insures adequate draft-free supply of pure, fresh air—cool in warm weather and comfortably heated in winter.

BATTERY RACK — The sliding battery tray which permits testing and servicing of the battery without disconnecting or lifting is an exclusive Oneida feature provided for chassis without underhood battery.

EQUIPMENT—Optional and extra equipment available to meet all requirements.

PRICES—The Oneida Safety School Bus Body can be had at a price, and of a size and type to meet any condition of school transportation. Detailed specifications and prices furnished on request.

ONEIDA PRODUCTS CORPORATION

SCHOOL BUS SALES DIVISION

CANASTOTA, NEW YORK

Cumulative Index to Editorial Subjects

This index covers the present Volume XX (1948-49) and Volumes XIX (1947-48), XVIII (1946), XVII (1945), XVI (1944), XV (1943), XIV (1942), XIII (1941), XII (1940), and XI (1939). A cumulative index to the previous Volumes I through X, was published in Volume X.

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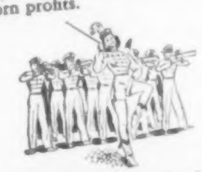

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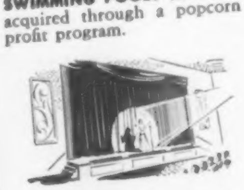

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WHY?—In order to find out how THE SCHOOL EXECUTIVE can increase its usefulness to school administrators

QUESTION 1: Which professional magazines in the field of education do you get?

	THE SCHOOL EXECUTIVE	Magazine B	Magazine C	Magazine D
Superintendents	88%	88%	87%	49%
High School Principals	70%	65%	53%	35%
Elem. School Principals	76%	62%	45%	24%
ALL THREE GROUPS	80.5%	76.5%	69%	41.5%

QUESTION 2: Which of these magazines do you like best for (a) articles, (b) news, (c) advertising and (d) general usefulness?

Voted Best for	THE SCHOOL EXECUTIVE	Magazine B	Magazine C	Magazine D
Articles	38%	36%	23%	3%
News	34%	35%	28%	3%
Advertising	39%	12%	28%	21%
General usefulness	34%	30%	32%	4%

(In each category, a few failed to make a choice.)

The remaining questions were asked only of readers of THE SCHOOL EXECUTIVE (comprising approximately 80% of those interviewed).

QUESTION 3: What sections of THE SCHOOL EXECUTIVE do you usually find most useful to you? Most frequent choices in order of rank were:

1. Educational Planning
2. Schools in Action *and* Our Schools (tied for 2nd place)
3. School Equipment News
4. Spotlight News
5. Editor's Page
6. For Your Professional Library
7. Keynotes *and* Washington Scene (tied for 7th place)
8. We Salute

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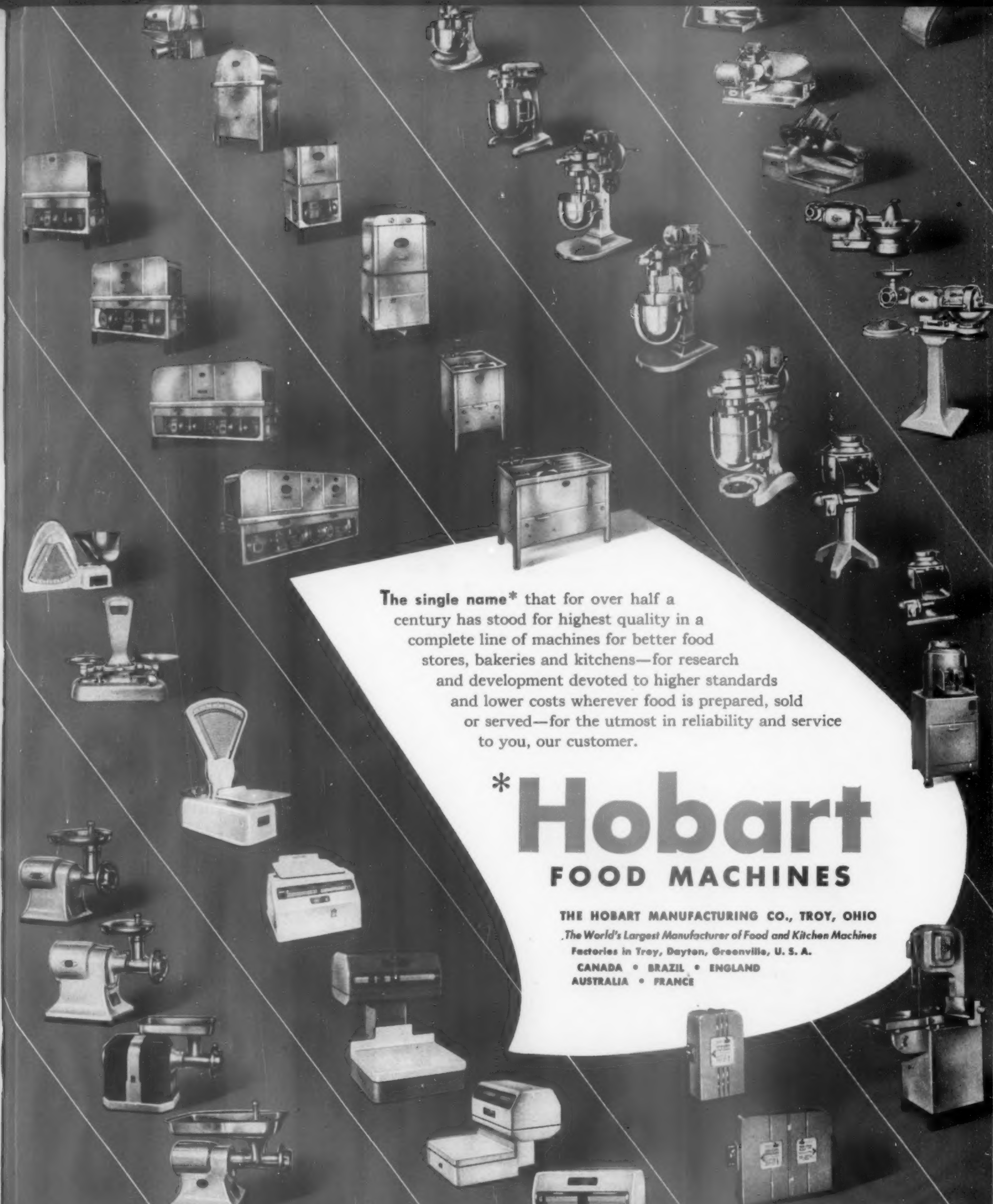
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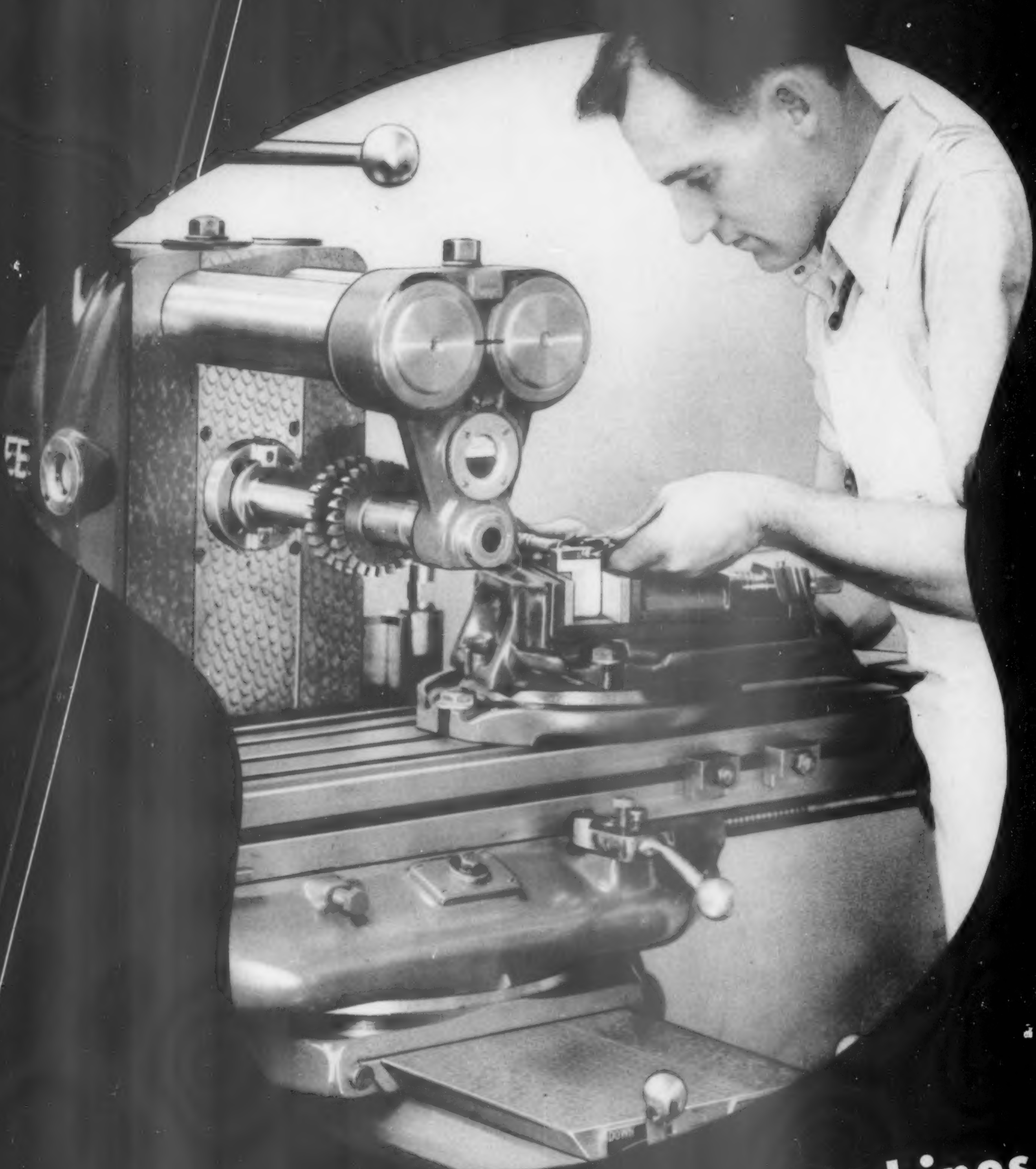

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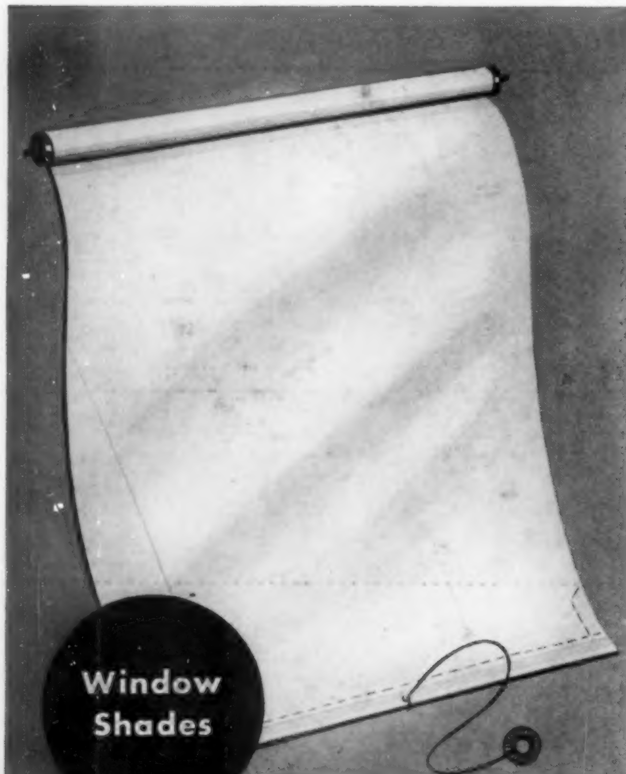

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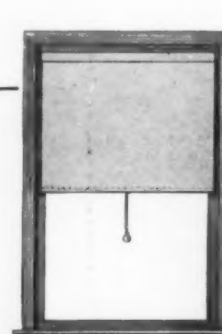

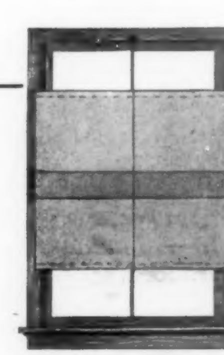

● Single-hung shade on inside brackets illustrated above is one of the most common types of hanging.

● Double shade hanging illustrated is unusually popular with schools where exact control of light and ventilation is required.